Report of the Work of The Rubber Research Board in 1954

(*Established under the Rubber Research Ordinance Chapter* 302).

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COMMONWEALTH MYCOLOGICAL INSTITUTE
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Report of the Work of The Rubber Research Board in 1954.

The present report is the twenty-fourth annual report of the Rubber Research Institute of Ceylon as constituted under the Rubber Research Ordinance (Cap. 302) and amended by Rubber Research Amending Ordinance No. 63 of 1946 and (Amendment) Acts No. 27 of 1948, No. 7 of 1950 No. 30 of 1951 and No. 50 of 1953.

CHAIRMAN'S REPORT

Board Membership.—The following changes in the membership of the Board occurred during the year:—

Mr. R. J. Hartley resigned and Mr. G. H. Carter was nominated in his place with effect from 1st April.

Mr. G. H. Dulling resigned and Mr. H. Creighton was nominated in his place with effect from 27th April.

Major Montague Jayawickrema, M.P., resigned on appointment as Minister of Transport & Works on 1st July and Major T. F. Jayewardene, M.P., was nominated in his place with effect from 15th July.

Mr. W. H. Moore, C.C.S., Acting Deputy Secretary to the Treasury, replaced Mr. L. J. de S. Seneviratne with effect from 13th August and was succeeded by Mr. W. D. Gunaratne, O.B.E., C.C.S., Acting Deputy Secretary to the Treasury, with effect from 1st October.

At its meeting of 1st March the Board passed a special vote of thanks to Mr. R. J. Hartley for his valuable services as a member since 1943.

The personnel of the Board at the end of 1954 was as follows:—

Ex-Officio Members:—

The Director, R.R.I.C.—Dr. H. E. Young, D.SC. (Vice-Chairman).

The Director of Agriculture—Dr. A. W. R. Joachim, O.B.E., PH.D.

The Acting Deputy Secretary to the Treasury—Mr. W. D. Gunaratne, O.B.E., C.C.S.

The Rubber Controller—Mr. B. Mahadeva, M.A., C.C.S.

Nominated Members:—

Representing the Senate—Senator C. F. W. Wickramasinghe.

Representing the House of Representatives—Major T. F. Jayewardene, M.P.

Representing the Smallholders—Gate Muhandiram Arthur D. S. Jayasinghe.

Representing the Planters' Association of Ceylon—Mr. G. H. Carter and Mr. H. Creighton.

Representing the Low-Country Products Association—Mr. W. P. H. Dias, J.P. (Chairman) and Mr. W. Herbert de Silva.

Meetings of the Board were held on 1st March, 7th April, 28th April, 7th June, 2nd July, 11th August, 22nd September and 1st November.

Committees:—

Experimental Committee.—The following changes in membership occurred during the year:

Mr. G. H. Carter was nominated to the Committee in place of Mr. R. J. Hartley.

Mr. B. Mahadeva was nominated as an additional member of the Committee.

Mr. H. Creighton was nominated to the Committee in place of Mr. G. H. Dulling.

The personnel of the Committee at the end of the year was as follows:—

Mr. W. P. H. Dias, J.P., (Chairman)
Mr. G. H. Carter
Mr. H. Creighton
Gate Muhandiram Arthur D. S. Jayasinghe
Dr. A. W. R. Joachim
Mr. B. Mahadeva
The Director (Dr H. E. Young)

Meetings of the Committee were held on 1st February, 7th April and 21st September.

Smallholdings Committee.—The personnel of the committee remained unchanged during the year. It consisted of:—

Mr. W. P. H. Dias, J.P. (Chairman)
Gate Muhandiram Arthur D. S. Jayasinghe
The Director (Dr. H. E Young).

A meeting of the Committee was held on 11th August.

Ad hoc Committees:—

Sub-Committee to consider re-engagement of Chemist.—A Committee consisting of Mr. W. P. H. Dias, J.P., Major Montague Jayewickrema, Mr. L. J. de S. Seneviratne, Senator C. F. W. Wickramasinghe and Dr. H. E. Young (Director) was appointed to consider the terms of re-engagement of Dr. E. J. Risdon, Chemist. A meeting of this Committee was held on 24th May.

Special Committee to consider the transfer and organisation of the Smallholdings Department.—A Committee consisting of Mr. W. P. H. Dias, J.P., Mr. B. Mahadeva, Gate Muhandiram Arthur D. S. Jayasinghe, Dr. H. E. Young (Director), Mr. W. I. Pieris (S.H.P.O.) and Mr. C. D. de Fonseka (Administrative Secretary) was appointed to consider the financial implications of transferring the Smallholdings Department to Nivitigalakele and to devise ways and means of improving the organisation of the Department. A meeting of this Committee was held on 11th August.

Selection Committee.—A Committee consisting of Mr. W. P. H. Dias, J.P., Dr. A. W. R. Joachim, Mr. W. Herbert de Silva and Dr. H. E. Young (Director) was appointed to interview candidates for appointment as Technical Assistant to the Director. A meeting of this Committee was held on 10th September.

Finance Sub-Committee.—A Committee consisting of Mr. W. P. H. Dias, J.P., Mr. G. H. Carter, Mr. W. D. Gunaratne, Mr. B. Mahadeva and Dr. H. E. Young (Director) was appointed to examine the Board's finances and make recommendations regarding the financing of its development programme. Meetings of this Committee were held on 9th November and 10th December.

Liaison with other Organisations:—

London Advisory Committee for Rubber Research (Ceylon and Malaya).—The Board contributed jointly with the Rubber Research Institute of Malaya to the cost of research on the quality and utilisation of raw rubber carried out at the Imperial Institute, London, under the control of the London Advisory Committee for Rubber Research (Ceylon and Malaya).

Meetings of the Committee and Sub-Committees were held as follows:—

London Advisory Committee	— 30th April.
Technical Sub-Committee	— 1st April.
Agricultural Sub-Committee	— 18th February, 1st July and 16th December.
Special Sub-Committee	— 8th November.

British Rubber Producers' Research Association.—The Board joined in the Government contribution to the British Rubber Producers' Research Association.

International Rubber Research Board.—The Chairman (Mr. W. P. H. Dias) visited Indonesia in connection with the meetings of the International Rubber Research Board and International Rubber Development Committee held at Bogor in March. The Vice Chairman and Director (Dr. H. E. Young) attended all the above meetings as the official delegate from Ceylon.

FINANCE

Income.—The Board's main income was derived from the cess on exports of rubber under Section 6(1) a of the Rubber Research Ordinance. Income from this source exceeded the estimate for the year by Rs. 165,329.

Monthly cess collections were as follows:—

January	...	Rs.	47,148	Brought forward		Rs.	495,020
February	...	,,	173,417	July	...	,,	203,505
March	...	,,	130,661	August	...	,,	69,088
April	...	,,	59,708	September	...	,,	76,665
May	...	,,	50,936	October	...	,,	64,885
June	...	,,	33,150	November	...	,,	194,418
				December	...	,,	47,348
Carried forward		Rs.	495,020				
				TOTAL		Rs.	1,150,929

A profit of Rs. 72,345 was derived from the normal working of Dartonfield Group.

Expenditure.—Current expenditure amounted to Rs. 1,167,959. The surplus of income over expenditure for the year was Rs. 348,083.

Capital expenditure amounting to Rs. 585,725 was incurred during the year, the main items being: Agricultural Development Rs. 272,249, Buildings and Lines Rs. 156,349, Machinery and Tools Rs. 88,768 and Laboratory Apparatus Rs. 41,049.

Accounts.—The accounts for the year with a Blance Sheet showing the property and liabilities of the Board will be prepared and submitted to the Auditor General for examination.

Technical Reports.—The Director's report, which embodies the reports of other officers, is attached.

Sgd. S. PATHMANATHAN,
Chairman of the Board,
Rubber Research Institute of Ceylon.

Dartonfield,
Agalawatta.
15th February, 1955.

DIRECTOR'S REPORT FOR 1954

By

H. E. Young

The demand for the services of the Rubber Research Institute continues to expand and the increasing tempo of development of the Subsidized Replanting Scheme has greatly taxed the technical, administrative, and practical aspects of the work and is making it more difficult to efficiently carry out the normal duties as well as the extra requirements involved. Unless greater funds and staff are made available the demands for services if continuing to increase will have to be curtailed.

An index of the work entailed in answering enquiries etc. is reflected in the correspondence figures for the year which were as follows:—

		Inward	*Outward*
Head Office	Administrative ...	4,659	4,688
	Technical ...	385	343
Mycology Department	...	636	352
Botanical Department	...	660	692
Chemical Department	...	399	406
Agronomy Department	...	726	596
Estate Department	...	2,240	2,112
S.H.P.O.	...	8,739	14,909
TOTAL	...	18,444	24,098

A considerable increase in the general correspondence of the Head Office was recorded since the last report. The large increase recorded in the work of the Estate Department is due to the extra work entailed in managing the Rubber Rehabilitation Scheme nurseries and arranging for purchase and distribution of planting material. An allowance granted by the Rubber Controller to officers engaged in this work was made for the extra work involved. The large demands for budwood of the new clones bred by the Institute also caused some extra pressure.

The Agronomy Department also showed a marked increase in advisory correspondence. The advisory correspondence of the Botany & Chemistry Departments decreased. This was partly due to the Estate Department taking over the distribution of budwood and to the issue of advisory circulars which answered many of the questions of the type formerly received. This also occurred in the Mycology Department. Now that the Oidium control technique is commercially solved the large number of enquiries on this subject has decreased markedly.

Staff:—

The general position was made very difficult by the resignation of the Mycologist, Ir. J. H. Van Emden, who left the services of the Institute at the end of May. So far no replacement for this important post has been secured. Fortunately however the season's work on Oidium control was completed before his departure.

Senior Staff:—

The Director, Dr. H. E. Young, was on duty throughout the year.

The Agronomist, Mr. D. H. Constable, was on duty throughout the year.

The Botanist, Mr. C. A. de Silva, was on duty throughout the year.

The Chemist, Dr. E. J. Risdon, proceeded on 4 months overseas leave on 7th August and returned to duty on 11th December.

The Mycologist, Ir. J. H. van Emden, resigned his appointment and left the services of the Institute on 7th June.

The Small Holdings Propaganda Officer, Mr. W. I. Pieris, was on duty throughout the year.

The Administrative Secretary, Mr. C. D. de Fonseka, was on duty throughout the year.

The Estate Superintendent, Mr. G. W. D. Barnet, was on duty throughout the year.

Intermediate Staff:—

The Plant Breeder, Mr. L. Wijeyegunawardane, remained on duty throughout the year.

The Assistant Mycologist, Mr. D. M. Fernando was on duty throughout the year.

The Research Assistant Agronomy, Mr. A. J. Jeevaratnam, continued his studies at the Waite Agricultural Research Institute, South Australia, under the Colombo Plan Training Scheme and was granted an extension of the scholarship for a further year for post graduate study.

The Research Assistant Chemistry, Mr. M. Nadarajah, was on duty all the year.

The Research Assistant Botany, Mr. L. B. Chandrasekera, commenced service on 2nd January and remained on duty for the rest of the year.

The Technical Assistant to the Director, Mr. O. S. Peries, commenced service on 1st November and was on duty for the remainder of the year.

The Senior Assistant Propaganda Officer, Mr. N. W. Palihawadana, was on duty all the year.

The Assistant Propaganda Officer (South) Mr. K. Wilson de Silva and the Assistant Propaganda Officer (North) Mr. H. H. Peiris were on duty all the year.

In addition a number of changes in Assistant and Minor Staff in Technical departments occurred as is shown in the respective departmental reports.

The staff position in the Administrative Department was as follows:—

Mr. J. A. Attygalle, Chief Correspondence Clerk
Mr. S. P. Fernando, Clerk Typist
Mr. W. D. Jayawansa, Clerk Typist
Mr. P. Samarasinghe, Clerk Typist
Mr. M. N. Jamaldeen, Filing Clerk
Mr. U. D. Gunadasa, Junior Clerk
Mr. P. D. A. Livera, Clerk-Librarian
Mr. M. T. Nallawangsa, Pay Clerk
Mr. C. Kirthiratne, Book-Keeper
Mr. E. P. D. Roberts, Junior Accounts Clerk
Mr. T. M. A. Rodrigo, Junior Accounts Clerk
Mr. D. P. W. Gunasekera, Store Keeper

The salaried staff of the Institute at the end of the year was as follows:—

Senior	*Intermediate*	*Assistant*	*Minor*	*Total*
7	9	81	33	130

General:—

The Director served as ex officio Vice-Chairman of the Rubber Research Board and as a member of the Smallholdings and Experimental Committees of that Board. He also served as a member of the Rubber Replanting Board and of the Central Board of Agriculture and was on the committee of the Kalutara District Planters' Association.

Meetings of the General Committee of the Planters' Association were attended in an honorary capacity and also of the Low-Country Products Association.

The Director attended the Meetings of the International Rubber Research Board, the International Rubber Development Board and the Far East Research Institutes Directors' Liaison Committee in Bogor, Java, as Ceylon's official delegate and attended the meeting of the Rubber Study Group in Colombo as an adviser to Ceylon's delegation.

Buildings:—

The extensions to the Administrative, Botany, Mycology, Chemistry, and Agronomy buildings commenced in 1953 were completed during the year. The extra working space provided has been of great value and has allowed the installation of new much needed modern equipment.

The tunnel type smoke house at Dartonfield was completed with the additional facility of a hot air generator to allow for air drying of sheet rubber.

A new dispensary and extra garage and stores accommodation were constructed at Dartonfield.

A new Assistant Staff bungalow was completed at Dartonfield.

Six further double cottages for minor staff and labourers were constructed at Hedigalla.

An extension was provided to Intermediate Staff Bungalow No. 2 and the construction of Intermediate Staff Bungalow No. 3 neared completion.

All buildings were repaired where necessary and maintained in good order.

A new 240 B.H.P. Vertical Blackstone engine coupled to a 160 K.W. 230 Volt generator was installed in the power house and worked satisfactorily during the year, and a new switch board was installed for controlling the 160 K.W. 55 K.W. and 24 K.W. generators.

Planting:—

At the end of the year the cultivated acreage of Dartonfield Group was 861 acres of which 283¼ acres were in tapping. The crop for the year averaged 585 lbs. per acre. Immature acreage was 558¼ acres of which 193 acres were planted with new experimental material in 1954. The budwood and seedling nurseries were 19½ acres in extent. Root diseases were the biggest problem in the new areas. Oidium leaf disease was kept in full control. The planting programme is being financed from reserve funds but reserve expenditure on this should diminish as the large acreage of immature rubber comes into bearing.

Mr. J. D. Farquharson continued his duties as Visiting Agent.

Rubber Rehabilitation Scheme:

The extra work required by the staff of the Institute in regard to advice and practical production of planting material for replanters under the Government Subsidized Replanting Scheme continued to increase. It can truly be said that without the very considerable help of the Institute this scheme would not be the success it has so far proved to be. All members of the Administrative, Technical and Advisory Services have been called upon for a considerable amount of work outside their normal duties. Such work makes heavy demands on time available for research and normal extension duties.

Five extra rubber instructors were appointed for duty with the Small Holdings Department to help cope with the extra demand for services in lining, and holing and advisory duties for replanters. In spite of this, and with an increasing replanting programme in the Island, the available manpower was overtaxed.

The Institute continued to operate the Replanting Scheme nursery at Egaloya which is the main source of planting material to the Smallholder. Over sixty acres of nursery beds are in production and a great amount of work is involved in obtaining supplies of seed and budwood, as well as in general nursery maintenance besides the lifting and despatch of material to be small holders as required.

The Botany Department again felt a heavy pressure of work involving much overtime (gratis) in regard to the planning and approval of commercial seed gardens and providing recommendations to the Rubber Controller in reference to their registration.

The Estate Superintendent arranged the supply and transport of materials and supervised the nursery in addition to his normal Institute duties which are continually increasing with the expanding acreage of the experimental plantings. The work involved in supervising the nurseries at Egaloya entails six visits per month which is that much time less for essential duties at Dartonfield.

If the Rubber Rehabilitation Scheme is to continue for long or be increased it will be essential that arrangements be made to provide a special technical and production service for this organization if the work of the Institute in regard to its legitimate functions of Research and Advice is not to be seriously reduced with consequent ill effects on Ceylon's Rubber Plantation Industry at a critical time in its history when the competition with synthetic rubber and cheap natural rubber from other countries is menacing the satisfactory exploitation of the Ceylon product.

Importation of Foreign Clones:

At the Far East Directors' Liaison Committee meeting in Bogor Indonesia early in the year the Director arranged for the importation of budwood of eighty of the best and most promising clones developed in Indochina, Java, Malaya and Sumatra in exchange for twenty of Ceylon's new clones to each country. In this way material of twenty new clones was received during the year from each of the above countries and was established in the R.R.I. nurseries. A full list of this material is given in the report of the Botany Department.

In addition material of the South American Leaf Blight resistant clones obtained from South America and arranged for previously was obtained from Malaya and established at the Nivitigalakele Division.

Export of Clones:

In addition to the material exported for exchange purposes a consignment of budwood of a number of clones was sent to Australia for use in New Guinea at the request of the Australian Government and on behalf of the Ceylon Government.

Publications:

During the year the following publications were issued:—

Advisory Circular No. 32—Crown Budding for Oidium Resistance (Revised)
" " No. 37A—Manuring—Magnesium Deficiencies
" " No. 37B—Potassium Deficiencies
" " No. 40—Tapping of Hevea Rubber
" " No. 41—Pink Disease
" " No. 42—Sale of Budwood
" " No. 43—Oidium Leaf Disease
" " No. 44—Diplodia Dieback and Collar Rot of Hevea & Blue Spot of Crepe Rubber
" " No. 45—Phythophthora Leaf Disease and Stem Dieback of Hevea.
" " No. 46—White Root Disease of Hevea
" " No. 47—Ustulina Rot of Rubber Trees
" " No. 48—Brown Root Disease of Hevea caused by Fomes lamaensis
" " No. 49—Root Disease in Replanted areas
" " No. 50—Orange Gall of Hevea
" " No. 51—Bird's Eye Leaf Spot of Heavea
S. H. Leaflet No. 6—Replanting of Rubber Smallholdings under the Subsidy Scheme

Combined 1st & 2nd Quarterly Circulars for 1953
Combined 3rd & 4th Quarterly Circulars for 1953
First Quarterly Circular for 1954
Second Quarterly Circular for 1954
Report of the work of the Rubber Research Board for 1953.

Contributions were made by the Director and staff to publications by other organisations. The list of people requiring the Institute's publications continues to increase. This is probably due to the increased interest in modern methods brought about by the Subsidized Replanting Scheme. A considerable number of new names of overseas organizations requiring our publications were also registered and the demand for our advisory circulars on certain subjects was worldwide.

The registration of the numerous extra recipients of free issues of the R.R.I. publications in Ceylon though encouraging is placing a heavy demand on finances.

Publications were issued both in English and Sinhalese. New subscribers to the R.R.I. publications were as far apart as Borneo, West Africa, Sumatra and Central America.

In addition certain advisory circulars issued during the year were requested for distribution by the Colonial Office as well as by individual countries such as Cyprus, Trinidad, India etc.

The usefulness of the material being published is reflected in requests for permission for reprinting a number of them in foreign planting journals particularly in India and Malaya.

Special articles were also prepared on request by the Director for publication in prominent rubber publications in France, and Indonesia.

Visitors:

The Institute was honoured by a visit of His Excellency the Governor General Viscount Soulbury on 28th June. His Excellency spent the day at the Institute and inspected the laboratories factory and estate.

A number of overseas delegates attending the International Rubber Study Group meeting in Colombo also visited the Institute.

A considerable number of overseas visitors representing scientific and commercial organizations visited the Institute and the number of Ceylon visitors continued to increase.

Demonstrations and Lectures:

Courses in budgrafting for commercial estate employees were conducted and Oidium control demonstrations were also carried out.

Lectures and talks were given by members of the staff to district and central planting bodies.

Departmental Reports:

The progress of the work of the various departments continued.

(1) **Botany.**—In the Botany Department several new Institute bred clones have shown outstanding results and it appears that we have now local clones which promise to be at least the equal of anything available in the world today. An average of 33.2 lbs. of dry rubber per tree in the fourth year of tapping for one of the new clones and 32.0 lbs. for another gives every reason for satisfaction as this is the most promising result yet achieved at the Institute with either local or foreign material. The most promising clones of this series are RLD.28, RLD.41 & RLD.45. Large scale commercial trials of the more promising new clones are being put out in 1955 and budwood will be distributed for trial use by planters in Ceylon as it becomes available in the nurseries.

The stage has now been reached when a number of new selections of promising clones will become available each year.

The present tussle between synthetic and natural rubber can most readily be countered by the Ceylon planter by reduction in costs of his product. This is most rationally achieved by raising the yield per acre. The plant breeding work of the Botany Department is aimed towards this end. With limitations of funds available for employment of suitably trained staff and for opening the necessary new areas for trials of the clones bred the programme is restricted to a level not commensurate with its importance. The available time for this work with existing staff is also reduced by work in connection with the Government Replanting Scheme.

The success achieved by the present small staff in production of clones which appear to be second to none in regard to yield etc. provides a very good demonstration of what could be done with increased staff and facilities that is, increased funds. The financial return to the industry of the money already spent on the work has more than justified its investment.

(2) **Agronomy.**—In the Agronomy Department clear results supporting the necessity for a complete N.P.K. manurial mixture were obtained and have been accepted by the majority of planters. The tendency for magnesium deficiencies to show up in the presence of adequate potash supplies particularly in the case of clone PB.86 and its progeny became evident. Evidence was obtained on a commercial scale to show that this could be cured by additions of dolomite which supply the extra magnesium requirement not present in the soil.

Potash deficiencies have become evident on lower grade soils and evidence that this has retarding effects on both growth and yield has been accumulated. A successful cure has been obtained on the first estate scale trial coupled with a very appreciable increase in yield.

The work on manurial problems has shown very satisfactory results when measured in extra pounds per acre of rubber obtained.

(3) **Chemistry.**—In the Chemistry Department work on Technical Classification of rubber was continued. Work on various aspects of production of smoked sheet, blanket and sole crepe continued with good results. Data in regard to copper content of latex was gathered and the new general technological work is beginning to show valuable results.

(4) **Mycology.**—In the Mycology Department the Oidium control programme was advanced prior to the resignation of the Mycologist and we have now reached a stage where commercial control of the disease on estates is very satisfactory indeed. This has been reflected in marked increased yields of latex and in the growth and better canopy of the trees. The use of wet spraying also proved effective from the ground but was equalled in control achieved by dusting which latter is much cheaper. The type of sulphur dust which is most effective is now well known from the work of the Institute and is freely available on the market. The quality of this product is now controlled by Government regulation to ensure that only suitable effective sulphur dust is used.

A trial of control of Oidium by wet spraying from the air with helicopters and fixed wing aircraft was carried out over an area of 2,000 acres. The trial was financed by the Ceylon Government and planting organizations and was supervised by the R.R.I. Messrs. Pest Control Ltd. carried out the

application with formulations of fungicides and at dosages worked out by the R.R.I. from previous trials. The experiment demonstrated that this method of application was very unsatisfactory and exerted little control at very heavy expenditure. Dusting from the ground proved quite satisfactory and much cheaper.

The rubber planters of Ceylon have been literally awakened by the Oidium control progamme. It has been shown by the Institute to be essential if good control is to be achieved for all dusting operations to be completed in normal circumstances before about 8-30 a.m. In order to cover the necessary acreages per machine dusters may be now seen and heard working well before daylight with the aid of lights. Many estates commence dusting before 4 a.m. and in some cases as early as 2 a.m. The usefulness of these recommendations has been well proved in practice as well as experiment and theory.

Due to the heavier foliage now prevalent on account of successful Oidium control the occurrence of phytophthora leaf fall during the wet periods later in the year has become more marked. The attack is however usually confined to localized areas on estates caused by topographical features. There have been no reports of loss of crop due to this disease which is understandable as it occurs late in the year when the tree's food reserves are high and the tree winters and produces new foliage before the strain on its reserves due to reduction of leaf surface due to the phytophthora caused leaf fall is felt. Experiments in control of Phytophthora leaf fall are proposed for 1955.

An increase in the incidence of bark rot and canker caused by *Phytophthora palmivora* has been reported from many estates following on the normal shady leaf canopy achieved. In all cases so far this has been shown to be due to the use of too dilute application of fungicides to the tapping panels in the wet seasons.

In regard to root disease the Institute's recommendations to avoid the poisoning of old rubber trees and leaving them standing to rot whilst replanting the areas have proved to be fully justified. A number of areas which were poisoned have been affected with severe epidemics of white root disease in the young plantings entailing very considerable loss of plants, finance and growing time.

It has been again demonstrated that the causative fungus frequently is present in a chronic form on the roots of the old trees without showing above ground symptoms. The leaving of these old trees standing has proved a very dangerous and expensive practice in regard to the replanted areas as they provide an admirable source of food for the development of the parasite for several years during the most susceptible period of the growth of the young rubber trees.

Uprooting the trees followed by examination of the stumps for the presence of the parasite with the application of sanitary measures to infected areas has resulted in a very considerable and satisfactory diminution of the incidence of the disease with consequent saving of money, labour, time, and growth in the young stands.

(5) **Small Holdings.**—The Small Holdings Department was very busy with demonstration, advice and actual help to small holders in their replanting activities as well as in normal routine, care and maintenance of rubber holdings. Preliminary arrangements for a trial in connexion with providing an Oidium control service for small holders were made.

Reports on 4,181 areas for new planting by small holders were prepared and advice and lining assistance was given. A large number of clonal seedlings were issued free to peasants and others sold to middle class small holders. Budded stumps and budwood, acid and straining mesh were also supplied. Efforts to improve the quality of small holders sheet were successful.

The work in regard to advice and help to planters working under the New Rubber Planting Scheme was continued with finance provided by Government.

Standard of Work:

Besides general individual letters of appreciation of the work of the Institute a letter was received from the Secretary of the Ceylon Association in London conveying on behalf of that association their congratulations and appreciation for the valuable work being done by the staff of the Institute for the Rubber Plantation Industry in Ceylon. Such expressions of appreciation of the work of the Institute's officers are very encouraging.

Detailed Departmental Reports:

The summaries and detailed reports of each department follow under their respective departmental headings.

REPORT OF THE CHEMICAL DEPARTMENT FOR THE YEAR 1954

By

E. J. Risdon

SUMMARY:

The Chemical Department is at present organised to undertake advisory and development type research work only and unlike the larger Chemical Divisions of the sister Institutes further East has a basic laboratory staff of not more than seven, of whom only two are academically qualified. The year to year programmes of the Department are at present based on the principle that advisory type work shall be carried out on the ad hoc investigations arising out of inquiries sent in by Estates or on behalf of Small-holders and that the development type work shall be designed either (1) to decrease the cost of manufacture or of production, (2) to improve or assist flexibility of manufacture (3) to limit the capital expenditure on new plant and equipment for increasing crops or (4) to assist in making the products and procedures of Ceylon's rubber Estates and Small-holdings acceptable and upto date on a national and international scale. It will be apparent therefore, that the Department carries out from time to time work on a large number of different aspects of raw rubber production technology. For convenience, the summarising Annual Report is usually divided up principally according to the basic raw material involved, *e.g.* latex, R.S.S., crepe etc., and this procedure has been followed in the 1954 Annual Report attached herewith.

The purely routine type advisory services are included in the statistics of subsection 1.2. on correspondence, visits etc. The work summarised and classified in Section 2 includes a subsection (2.2) on the use of the metrolac for subtasks of small mono-clonal areas and does not at present encourage the view that this instrument is necessarily very exact for mono-clonal areas. Consideration has also been given to the means of checking the d.r.c. of

ammoniated field latex, sold for concentration purposes, without the use of relatively elaborate equipment, and it seems likely that the use of large sub-samples of the bulk of latex may be convenient and reasonably satisfactory, as suggested in the Report for 1952. The work carried out to assist Estates to limit precoagulation of latex has been written up, with special reference to crepe, for the Quarterly Circulars and various experiments involving the transportation of Nivitigalakele latex to Dartonfield for R.S.S. manufacture are described—the proportion of ammonia used in the field under normal conditions varied between .01 per cent. and .024 per cent. depending upon the clone. A start has been made to the laboratory investigation of magnesium etc. content of lightly ammoniated field latex and of centrifuge concentrate prepared on a small scale; the initial samples were collected in 1953.

Work on various aspects of R.S.S. production has continued and is described in Section 3, which contains a comment to the effect that the appearance of 'rust' in a number of R.S.S. factories could be prevented by more liberal use of milling and washing water. The examination of the performance of the Guthrie mill, of 'temporary type' milling equipment and of commercial temporary type smoke-houses has continued. With increasing crops due to replanting and with a non-stable differential between R.S.S. and crepe these subjects can all be of importance. Various alterations have been made to the tunnel type smoke-house used for the small scale production of R.S.S. and of air dried sheet and further tests are in hand. The small (50 lbs.) experimental smoke-house, built for an investigation of the various factors influencing drying rates and for other purposes, has been, in use during part of 1954. In order to ascertain whether the ground floor of standard R.S.S. type smoke-houses can be used for smoking with a substantial increase in overall capacity, the Nivitigalakele smoke-house has been converted to the 'outside furnace—underground flue' system on an experimental basis.

The work on blanket and sole crepe is described in Section 4 and includes (subsection 4.7) a summary of the experiments with oxalic acid. Judged by R.R.I.C. conditions, it seems questionable whether oxalic may be regarded as a panacea for all bleaching difficulties, although it may be of value with, for example, pale coloured latex. The work on the lamination of sole crepe laces has been written up and is to be found in a recent issue of the Quarterly Circulars. A small scale survey of the hardness, M50, of standard Estate sole crepes has been put in hand and it is apparent that there are appreciable variations between the sole crepe samples.

Sections 5 and 6 deal with subjects which are at present of less apparent general interest to producers and include an account of the work concerned with the production of technically classified rubber. The data accumulated will greatly assist in the commercial production of T.C.R. in Ceylon at the appropriate time, but it is probably desirable to carry out some work on the subject of 'level changing' in due course. Examination of data collected in connection with small scale surveys of the copper content of Ceylon's R.S.S. and crepe does not suggest that much, if any, of the high grade material would be expected to show a copper content above the figure specified by the R.M.A. The work on the microbiological destruction of effluents has been extended to an examination of the aerobic destruction of diluted serum and to the destruction of centrifuge skim serum, using in the latter case raw material obtained mainly from Messrs. The Latex Corporation of Ceylon Ltd. It is anticipated that ordinary R.S.S. or crepe serum can be destroyed either by an anaerobic process followed after settling by an aerobic one, or after suitable dilution by a wholly aerobic process. However, further process details are required.

DETAILED REPORT

Section I—General:

1. 1. Staff.—The Chemical Department now consists of the Chemist, the Research Assistant, Mr. M. Nadarajah, B.Sc. (Ceylon), three Laboratory Assistants, Messrs. D. S. Muthukuda, M. T. Veerabangsa and G. G. Gnanasegaram, one Attendant and one Peon. Three to six labourers are made available by Estate Department as required. Mr. Nadarajah completed his period of probation in December. The Chemist was absent on four months overseas leave commencing near the beginning of August.

The table below show the working days of absence (exclusive of overseas leave) by the various members of the Department during the year.

By			Casual	Vacation	Sick Leave	Total days
Chemist		...	3	-	-	3
Research Assistant		...	19	6	9	34
Lab. Assistant	(D.S.M.)	...	12	12	7	31
	(M.T.V.)	...	12½	1	8	21½
	(G.G.G.)	...	13	13	19	45
Attendant	(P.K.W.)	...	9	12	4½	25½
Peon	(W.D.D.)	...	3	6	1	10

1. 2. Advisory Services, Correspondence etc.—The volume of the advisory work is again considerable, and a large part of the time of the officers of the Department is devoted to visits, correspondence and examination of the literature in connection with the advisory services provided by the Department. The table below gives a summary of much of the data relevant to this subsection.

(*a*)	Unsolicited samples etc. submitted for Tests or Report ...	44
(*b*)	Solicited samples (excluding technical classification samples)	85
(*c*)	Technical classification samples received	683
(*d*)	Visitors to the Department	71
(*e*)	Correspondence outgoing, excluding Roneoed letters etc.	400
(*f*)	Correspondence incoming	399
(*g*)	Roneoed letters, Pamphlets and Reports	6
(*h*)	Visit by the Staff of the Department (details below) ...	140

By		To R.R.I.C. Estates	To other Estates	Other Visits	Total
Chemist	...	10	25	13	48
Research Assistant	...	4	8	1	13
Lab. Assistants	...	31	40	8	79

Advisory visits normally require the preparation of a detailed report on many aspects of the process followed. The preparation of these confirmatory reports frequently requires more time than the visits themselves. Acknowledgement is made to the Estate Department for the temporary services of the Rubber Maker on a number of these visits.

1. 3. Publications etc.—The publications of the Institute partly or wholly contributed by members of the Department during 1954 include the Annual Report for 1953 and two articles for the Quarterly Circulars of which only one (R.R.I.C. Quarterly Circular 1954 30-1 p. 1-8) has been published to date. A further three articles are in various stages of preparation with a view to presentation for publication. Proof reading of the publications of the Department submitted in 1953 was carried out mainly in the Department.

1.4. Miscellaneous.—During the temporary absence of the Director, the Chemist attended a limited number of the meetings of the International Rubber Study Group held in Colombo in May. During the four months of absence by the Chemist, the Department operated under the control of the Director. A detailed programme of experimental work was left by the Chemist for the guidance and assistance of the Department's staff. Since the Chemist did not return to Ceylon before December 10th, it is relevant to explain that all the work of the Department could not be systematised for 'Report' purposes before the end of the year.

Section II—Latex:

2. 1. Equipment.—The M.S.E. centrifuge and the A.C. generator for use with this unit have been installed and arrangements have been made on the Department's votes to provide limited A.C. current for the Agronomy and Chemical Departments. The Doran pH meter has been returned to its makers for examination and a small Beckman instrument purchased pending the repairs of the Doran.

2. 2. Approximate Determination of the d.r.c. of Fresh Latex.—Approximate determinations of the d.r.c. are required for various factory and record purposes, and information about the reliability of the standard O'Brien scale glass metrolac used for budded rubber latex has been sought (annual Report 1952, 1953) by comparing the d.r.c. obtained by trial coagulation to the value obtained with the metrolac on the same latex suitably diluted. Part of this work was done by Estate Department and part by the Chemical Department and, subject to certain basic assumptions, it was concluded that the data presented was in agreement with the view that metrolac readings can be made reasonably suitable for determining the approximate d.r.c. of the bulk of a large number of tappers' latex for certain purposes (such as the estimation of the weights of bisulphite, RPA. 3, etc. required for the bulk), but that the use of metrolac readings to calculate accurately tappers' daily, monthly or annual total rubber output could be misleading.

In these experiments the tasks were tapped by different tappers and did not, in general, contain the same clones, hence the data obtained does not demonstrate adequately whether a metrolac can be employed with reasonable accuracy in large monoclonal blocks where the trees are all of approximately the same age. Large blocks of this nature are found on commercial Estates but are not available on R.R.I.C. Estates. However, it was thought that data of this nature could perhaps be obtained by splitting a number of monoclonal tasks or part tasks into subtasks and an experiment of this type has been organized at Nivitigalakele and is being carried out largely by Estate Department. Subtasks of three clones in the Nivitigalakele 1946 clearing have been selected, and from the data at present available for this experiment, it would appear that the differences between the numerical value of the error of the metrolac between clones and between subtasks of the same clone are not necessarily large. (This implies that the metrolac probably can not invariably be relied upon in commercial practice even when dealing with latex from monoclonal blocks). This is not in numerical agreement with the theoretical deductions of H. Fairfield Smith nor is it in entire agreement with previous small scale data at Dartonfield. There are, however, other comments in the literature which lead to the deduction that the metrolac need not necessarily be reliable for tasks of 'similar' trees. Accordingly this experiment is now being repeated at Dartonfield.

2. 3. Determination of the d.r.c. of Ammoniated Latex.—Certain aspects of this subject have been mentioned in the Reports for 1951 and 1952 and in the Quarterly Circulars. The procedures suggested in British Standards

1672: Part I: 1950 were applied to lightly ammoniated fresh Ceylon latex and under the conditions employed it was tentatively concluded that Estates would not, in general, be expected to lose financially by selling latex on the basis of its total dry rubber as received by the buyers instead of on the basis of its fresh total rubber as 'tapped', provided there was no undue delay in delivery and testing.

During 1953 and 1954, while some crepe producing Estates turned to R.S.S. production, other Estates sold a proportion of their crop as ammoniated latex to Messrs. The Latex Corporation of Ceylon Ltd. Few of the latter Estates equipped themselves with the accurate balances usually necessary for the exact determinations of the d.r.c. of their latex and as a result there have been a number of semi-official inquiries concerning means of checking the dry rubber estimates of the buyers. Limited numbers of these Estates have continued to base their check figures on the tappers' input (metrolac) readings, pointing out that on the basis of the findings quoted in the proceeding paragraph the 'factory excess' should remain approximately the same. Investigations in connection with subsection 2.2. above suggest that the mean 'error' of a metrolac may not necessarily be constant from month to month especially if the areas in tapping change. Although the changes in the mean 'error' of the metrolac need not necessarily be large, Estates have not been encouraged to rely too much on the metrolac, particularly when only a portion of the crop is sold as latex or when the areas in tapping (and possibly the tapping systems) are changed.

Tests carried out previously at Dartonfield showed that the differences between the d.r.c. obtained by the methods of the British Standards Institution, suitably modified for fresh unammoniated latex, and by a trial coagulation of the type described in the second supplement to Advisory Circular No. 17 are not necessarily numerically large, although they may be significant at $P = .05$, (but not at $P = .01$). This observation has been utilised on certain Estates to test the total rubber in deliveries for Messrs. The Latex Corporation of Ceylon, Ltd.—the absence of good quality laboratory balances being largely overcome by the use of subsamples of one gallon or upwards as suggested in the Report for 1952. The figures obtained by one of these Estates have been examined and for 35 deliveries of latex in 1954, averaging 454 lbs. of rubber each, the mean difference between the buyer's and seller's estimates of the daily delivery is about 1.2 lbs. per 100 lbs. of rubber sold with a standard deviation of 4.6 lbs. Examination of the figures on the 3 days immediately following the above mentioned deliveries showed on each day % differences between buyer's and seller's estimates of the d.r.c. exceeding 2.5 times the standard deviation, strongly suggesting errors in the estimates (or in the sampling) at some stage. The value of the standard deviation found seemed rather large and various tests have been started to ascertain whether this figure could be reduced by a little more careful attention to detail. The preliminary data suggests that reasonably accurate estimates of the d.r.c. in lbs. of rubber/gallon of latex can probably be obtained by the above procedure, provided that the subsample selected is truly representative of the bulk of latex concerned and due care is taken in the estimation. This subject is considered important as it may assist in preventing unjustified complaints against the buyer's payments and may, perhaps, at the same time facilitate the detection of any reasonable cases for complaint.

2.4. Storage of Ammonia Solution.—Small-holders Latex Corporatives in the Kalutara District sell lightly ammoniated latex to the Latex Corporation and complaints have been received against certain of these Co-operatives on the grounds of supplying under-ammoniated latex. It appears that the ammonia solution supplied to the Co-operatives in 40 gallon drums by the

latex buyers may have appreciably diminished in strength, even with normal corking, before the drum is emptied or may have been supplied under strength initially. Accordingly, A.P.O.(S) and two R. II in his District have been given instruction at the R.R.I.C. and elsewhere in the methods to be employed to determine the ammonia content of the stock solutions at the latex centres so that they may issue to the officers in charge at the centres 'correction factors' depending upon the strength of the ammonia solution held in stock at the centre. It is hoped that this procedure will avoid further complaints in the ranges concerned.

Difficulties of a similar nature appear to have arisen at one Estate and may have occurred at others. The Estate in question was making R.S.S. using ammonia as latex anticoagulant in the field, by diluting an old stock solution orginally made up as 10 per cent. ammonia, but which, on analysis after a period of heavy precoagulation in the second monsoon of 1954, was found to be less than 5 per cent. to ammonia. It appears appropriate therefore to warn Estates, which are reluctant to make up their stock solutions of ammonia at fairly short intervals (due to their crop not being sufficient to prevent the imposition of appreciable cylinder hire charges), that these stock solutions can gradually lose their strength, and hence their effectiveness as anticoagulants on dilution unless a correction is applied. Depending upon their consumption of ammonia, the loss of high grade crop as a result of increased precoagulation and upon the appropriate cylinder hire charges etc., Estates might in some cases find it desirable to buy and share a cylinder of ammonia gas rather than each buy its own cylinder.

2. 5. **Precoagulation.**—This subject has been mentioned in some detail in the Report for 1953 and in the relevant paper at the 1953 Conference. An article, summarising a large part of the literature and describing various experiments carried out by the Department at outside Estates, has been submitted to the Director, as Editor of the Quarterly Circular. The majority of these experiments were designed to limit the precoagulation in latex intended for crepe manufacture, and, under the conditions employed, washing soda powder appeared to be a suitable cheap anticoagulant. However, when R.S.S. is the major product there are, according to the literature, good reasons for using ammonia as the anticoagulant in preference to washing soda, and, in view of the requests for information on the subject of limiting precoagulation in latex intended for sheet, some tests have been carried out using part and later the whole of the Nivitigalakele Division crop. The optimum proportion of ammonia added in the field seemed to vary between .01 per cent. and .024 per cent. (on the latex), depending upon the clone. In order to transport this latex to Dartonfield, a distance of 6 to 7 miles, for manufacture a further .005 per cent. of ammonia is often added at the collection tank. The quantity of acid used to coagulate this latex has been rather larger than normal but once the initial difficulties were overcome no evidence of bubbles etc. was observed. The prevention of precoagulation in latex, obtained shortly after wintering, was not invariably readily accomplished.

The data obtained and experience gained with the Nivitigalakele crop has assisted in dealing with certain of the general problems on this subject, but does not necessarily permit the Department to make definite recommendations concerning the quantities of ammonia to be used in other areas even if the clones involved are believed to be the same. An attempt has been made to apply the data on a large scale at a commercial Estate in the Elpitiya district; unfortunately, this experiment has not been completed due to (*a*) exceptionally heavy rains (over 5 times the 1953 figure) in the area concerned, to (*b*) the absence of the Chemist and to (*c*) the pressure of other commitments. The preliminary experiments suggested that the quantities of ammonia usually

employed, *e.g.* .01 per cent. to .02 per cent., were quite inadequate under the conditions encountered, that is late tapping generally but not always without a partial washout. It would appear that .06 per cent. to .08 per cent. ammonia might be necessary, but this may, to some extent, be due to the fact that the interval between tappings was longer than the standard 1 to 3 days. It is not yet clear whether the TJ. 1 latex in this area is particularly unstable and it is intended to return to this subject later.

As mentioned above and fully described in the literature washing soda is usually considered unsuitable as an anticoagulant for latex intended for R.S.S. manufacture due to the risk of bubble formation. However, as washing soda is comparatively cheap some experiments are in hand to ascertain the 'critical concentration' of washing soda in latex below which bubbles would not normally be expected in the finished R.S.S.

2. 6. Latex Strainers.—Following the experimental use of P.V.D.C. mesh for tea withering the local agents of Messrs. Fothergill Harvey, Messrs. James Finlay & Co., Ltd., requested the R.R.I.C. to comment upon the use of P.V.D.C. mesh for latex straining. The size of the apertures in the material supplied was rather large for any but the coarsest straining but it seemed worthwhile making up an experimental coarse strainer, which has been used by Estate Department. Provided the mesh is properly fixed to the strainer box, *e.g.* by sandwiching between wood and not by just nailing the mesh to the box, and provided considerable pressure is not applied to the upper surface of the mesh (*e.g.* to clean it while in operation), there seems to be little difficulty in making the mesh last well over 110 working days.

2. 7. Magnesium etc. Content of Ceylon Latex.—The adverse influence of excessive free magnesium in concentrated latex, bought for certain end purposes, has been emphasised in the literature and Collier (R.R.I.C. Quarterly Circular, 1953, 29 3-4, p. 91-93) has implied that the main manufacturer of centrifuge concentrate in Ceylon would prefer to buy latex whose magnesium content is within suitable limits. According to the literature a determining factor in the stability of latex is the ratio of phosphorus to magnesium and an investigation of the concentration of magnesium, phosphorus and certain other inorganic components of ammoniated field and of centrifuge concentrated latex has been started on samples collected in 1953 and 1954. The investigation will cover commercial and experimental clonal latex obtained from trees growing under different conditions and sampled at different times of the year. The preliminary data are in agreement with the view that the magnesium content of ammoniated field latex is higher when the selected tasks are sampled before wintering than is found just after wintering, and in the former case can, with certain tasks, approach 2,000 p.p.m. on the latex solids.

The subject is likely to be of even greater interest now that cases of magnesium deficiency in young plantings have been detected (Advisory Circular No. 37A) and now that normal manuring with, for example, dolomitic lime is recommended. Using the high figure of 2,000 p.p.m. of magnesium on latex solids, it will be noted that the addition of, for example, a total of five lbs. of dolomitic lime (of not less than 20 per cent. MgO) within the root feeding circle of a tree during its first five years of growth is equivalent in terms of weight of magnesium to the amount lost in the latex over a period of about 15 years at a rate as high as 20 lbs. of total solids lost per tree per year. How much of this magnesium would be taken up by the tree and how much, if any, will be retained to appear as undesirable excess magnesium (*i.e.* excess in relation to the available phosphate) in the latex is, as far as the Department is aware, not yet known. Since rubber production must be the principal criterion it is to be expected that proven cases of decreased actual or potential

latex production or of impaired tree characteristics *e.g.* disease resistance etc., due to magnesium deficiency must be corrected by (magnesium or other) suitable treatments. However, at the present state of knowledge of this whole subject a certain measure of careful thought may *perhaps* be necessary from time to time in the case of those Estates which may wish to supply a large part of their latex from a large number of clones (rather than from suitable selected clones) to centrifuge concentrate manufacturers in Ceylon. In this connection it is relevant to point out that information reaching the R.R.I.C. seems to suggest that the concentration of magnesium in Ceylon's centrifuge concentrated latex may be higher than is usual from Malaya and that PB. 86 in Ceylon has received some adverse comments in this connection (R.R.I.C. Quarterly Circulars 1953, 29 3-4, p. 93, para 2).

Section III—Smoked and Air Dried Sheet:

3. 1. General.—The advisory correspondence has been largely concerned with rust, precoagulation, bubbles and with the construction and operation of smoke-houses. The volume of correspondence on the last subject has tended to show a decrease with the increase in the Colombo price of blanket crepe.

The R.S.S. milling and smoking facilities constructed by Messrs. Brown & Co., for experimental and production purposes at Dartonfield have been available for use during the period under review. These facilities consist of a Brown's Guthrie Cadet Sheeting Mill, a tunnel type smoke-house and a smaller purely experimental drying and smoking unit of capacity about 50 lbs.

3. 2. Rust on R.S.S.—While rust is a well known process fault in R.S.S. factories, it seems appropriate to refer to this subject briefly—there are further details in C.P. 1846 p. 9-10—as an appreciable number of Estates, frequently Estates with mainly 'temporary type' R.S.S. facilities, were visited in 1953 and 1954 in connection with the appearance of rust. During the course of the visits to some of these Estates, it was apparent that certain of them had not organised their labour in such a way that unduly prolonged dripping was prevented.

It would seem probable from the nature of the fault that much of the difficulty might be avoided, at least in certain cases, by the liberal use of washing water during and after milling of the coagulum. This aspect of the subject is not emphasised in the R.R.I.C. standard booklet but at present appears to be of major importance at certain Estates. This defect, *e.g.* inadequate washing, is particularly noticeable at some crepe Estates where scrap crepe mills may be taking an undue proportion of the limited water available. While certain Estates have equipped themselves with relatively high pressure water sprays to avoid the appearance of rust, it should not be assumed that this procedure is invariably essential, particularly when the interval between milling and the time when the sheets reach smoking temperatures is short.

According to the literature the micro-organisms involved in the production of rust are usually aerobic so that if it becomes necessary to store freshly rolled sheets it is probably desirable that this should be done under water or failing this after chemical treatment. It is therefore of interest to record that one Estate, short of transport facilities, is known to store its milled sheets for about 24 hours under water without apparent difficulty.

3. 3. Milling.—It may be remembered that the R.R.I.C. previously obtained for a short period the use of a Guthrie Sheeting Mill and that T. E. H. O'Brien in 1940 briefly summarised the capabilities of this machine. The number of these machines in use in Ceylon has increased in recent years and it became necessary for the purpose of the advisory and experimental

services to purchase a unit for permanent erection at Dartonfield. This machine has been in experimental and production use and has been available for demonstration purposes during the period under review. Some experimental work had to be carried out in order that the Department could advise Estates and Visiting Agents about the correction and prevention of standard process difficulties during operation.

Preliminary figures have been obtained for the production rate of this machine with tank coagulum (not continuous strip) at near optimum conditions for the R.R.I.C. using slabs of coagulum about $1\frac{1}{2}''$ thick made from latex standardised at $1\frac{1}{4}$ lbs./gallon and it is at present doubtful whether the figures quoted by Wilkin (R.R.I.C. Quarterly Circular, 1953, 29 3-4, p. 99) can be greatly exceeded with normal thickness sheet. The data of O'Brien suggest that with a Brown's Guthrie Sheeting Mill, the milling of tank coagulum of about $1\frac{1}{2}''$ thickness made from latex standardised at $1\frac{1}{2}$ lbs. gallon is difficult. However, as an increase in d.r.c. at standardisation might in many cases reduce the outlay for coagulation tanks, further work has been carried out. To date it has not been found easy to mill uncut slabs of $1\frac{1}{2}''$ thickness, made from $1\frac{1}{2}$ lbs./gallon latex, to a final dry thickness equivalent to 8 ozs. per square foot without some tearing during process. In general, when the nips are adjusted to reduce the tearing the finished sheets tend to be over 8 ozs./ft.^{2}. It is hoped to repeat this work with cut and uncut slabs.

The temporary milling facilities at a number of outside Estates have been examined for record and other purposes. A number of Estates appear to have achieved considerable success with power driven Small-holders type mills with or without old laminating mills. Other Estates have carried out their milling using full size smooth crepe mills together with a new spiral marker mill of adequate size and robustness for the process followed, and this procedure is now under investigation at R.R.I.C.

3.4. Smoking and Drying.—The work on this subject during the period under review covers a large number of different aspects and the report is therefore split into appropriate distinct portions.

(1) Application of Basic Principles: As a result of the background work of van Harpen, Piddlesden and others the significance of basic factors, such as temperature, thickness etc. upon the time required for drying is well known. While there appear to be some gaps in even this basic information, the quantitative application of the data to conditions encountered commercially is usually not easy. Thus, either sufficient information is not available or the data may have been obtained under conditions where, for example, the control of temperature has probably been inadequate. In practice it is often possible to suggest how the operation of a smoke-house might be improved in theory, but it is not necessarily possible to state how large a decrease in drying time might reasonably be expected under the modified conditions.

In view of the fact that crops are increasing, it seems desirable to supplement the information available for advisory work of this nature in order that more detailed advice could be given on the anticipated capacity of standard units. Accordingly a small drying and smoking unit with a capacity of about 50 lbs. has been built and is in operation for the purpose mentioned above. The unit is equipped with a Colombo Commercial Co., Ltd., direct fired oil burner and with a small auxiliary fan for introducing, when required, additional (cold) air to the bulking chamber. Charts obtained from 24 hour recorders show that the unit can often be operated to within about ± 1 to 1.5°F of the required temperature. The unit is not yet equipped for humidity control, independent of the temperature, and all the information required for advisory purposes will not be available for some considerable time.

(2) Construction and Operation of Estates' Temporary Smoke-Houses: This subject and the procedure adopted is briefly referred to in the Report for 1953 (p. 16-17) and in the 1953 Conference Papers. Until recently the Department has been reluctant to advise upon the construction of good temporary smoke-houses in any detail, partly because the information available seemed quite inadequate and partly because of the rather high risk of partial or complete destruction by fire, or by mechanical and/or structural failure. The Department did, however, play an important part in the modifications of the original Helembe temporary smoke-house to the present (Gottelier) Helembe unit, which has been reproduced on a number of other Estates. This smoke-house carries a network of underground branch flues with outlets under the racks of sheet. The furnace is, in effect, a comparatively deep underground covered passage with only limited smoke outlets over which sheets are not generally hung.

Examination of one of these smoke-houses in operation showed that there may be a distinct vertical gradient of upto 10°F in the smoke-house (the top of the smoke-house being the hottest part), but little evidence of temperature differences in a horizontal plane was found. This implies that wet sheets should invariably be placed on the lowest tiers and the drier sheets at the top, and that any unexpected temperature rise (*e.g.* due to over-stoking) should be fairly readily detected on thermometers near, but not too close, to the well fitted doors. With an operating temperature of only about 120°F at the level of the top tiers, sheets at 8 ozs./ft.^{2} placed in various parts of the unit dried down to .2 per cent. mositure in not more than 5-6 days. As far as the Department is aware there have been no unexpected fires in these buildings. An early double Helembe smoke-house of initially about 5,000 lbs. capacity was estimated by the Superintendent concerned to cost about Rs. 1,550/-.

A cheaper and popular temporary smoke-house called the Rambukkande type temporary smoke-house has been erected by B. Cocking, Superintendent at Rambukkande Group near Ratnapura. The Rambukkande unit contains two internal furnaces (perforated, lidless oil drums, laid on their sides and submerged below the floor) on opposite sides of the smoke-house. The open or firing ends of the furnaces are in a vertical line with the outer walls. The unit has a cadjan roof with an untreated hessian 'ceiling' nailed to the roof timbers. The operation of one of these units in the Elpitiya district has been investigated in some detail and while the unit appeared to be capable of drying standard thickness sheets in 4-6 days there are certain pecularities which were not observed in the Helembe unit examined. Thus, the temperature differences between the various parts of the smoke-house at the level of the lowest tier are often quite marked: the corners farthest from the furnaces are usually the coolest parts of the unit and the area over the furnaces the hottest. The areas over the two furnaces are not necessarily at the same temperature. It would appear desirable to operate these units with the wet sheets on the bottom tiers, subject to the proviso that blisters or 'pulling through' of sheets (particularly if thin bamboo reapers are used) might be found with the sheets on the reapers immediately over the furnaces. However, as far as the Department is aware, the Rambukkande units can give excellent service as temporary smoke-houses, particularly with thin sheets. It is understood that a single unit with a working space of about $12' \times 12' \times 12'$, equivalent to about 2,620 lbs. capacity (of $1\frac{1}{4}$ lbs. sheets), costs under Rs. 400/-. This unit contains more tiers per rack than the early Helembe unit.

Various other temporary smoke-houses have been examined during the period under review, and since this subject is of general interest it is hoped to reproduce with comments selected drawings of various temporary smoke-houses in an issue of the Quarterly Circulars.

(3) Fires in Temporary Smoke-Houses: This subject is discussed in C.P. 1846 p. 11-12, but since the comments may be comprehensible only to those familiar with the types of temporary smoke-houses recently erected in Ceylon the subject is not mentioned here. Copies of the relevant subsection of C.P. 1846 may be obtained by reference to the Director of the R.R.I.C.

(4) Permanent Smoke-Houses; R.R.S. Types: The standard medium and large size R.R.S. type smoke-houses are multi-storey buildings with, usually, 2 floors of rubber located above a ground floor bulking chamber containing a fire trolley on wheels. In view of the fact that crops are increasing as a result of replanting it seemed desirable to ascertain whether the capacity of these buildings could be increased to deal with part at least of these anticipated extra crops. One obvious improvement, if practicable, would be the removal of the internal fire trolley so that the ground floor could be used for smoking. This suggestion by the R.R.I.C. involves the construction of an outside furnace with a network of flues beneath the floor and various designs have been prepared for a limited number of Estates. Unfortunately, all these Estates decided that the system was in effect too experimental for them at present, so that it became necessary to convert the small R.R.S. unit at Nivitigalakele to this system as a trial. This conversion, which is being carried out on the Department's votes, has been completed but only preliminary data on the use of the modified smoke-house is at present available. There is, however, no evidence to suggest that the system is basically unsuitable for the purpose intended.

The advisability of doing away with the ground floor bulking room has also been raised from another viewpoint. Thus, the ground floor size of the largest R.R.S. unit for which the R.R.I.C. supplies plans is approximately $21' \times 21'$ with a bulking chamber height of about 10'. Recently, one Estate has suggested that, with ground floor surface dimensions of this size or larger and with only 1 fire trolley, the smoking might be uneven or the cost of almost daily sheet movement excessive. A second Estate also inquired whether with 3 or more floors of rubber and with ground floor surface dimensions exceeding $21' \times 21'$, the use of 2 or more fire trolleys is desirable and/or practicable. Both comments arose in connection with the construction of new smoke-houses and it seems likely that one of these Estates has adopted an outside furnace and flue network system, but the design has not yet been examined in detail by the R.R.I.C.

(5) Permanent Smoke-Houses—R.R.I.M. Tunnel Type: Tunnel type smoke-houses are described in the publications of the R.R.I.M. over the period 1937-8 with further comments in Planting Manual No. 9. These smoke-houses are mentioned in 'The Preparation of Plantation Rubber in Ceylon' published by the R.R.I.C., but various difficulties have apparently been encountered in Ceylon in attempts to make locally built tunnel type smoke-houses operate as efficiently as appears to be found in Malaya. Further, since this type of permanent smoke-house should be attractive as a labour saving unit, it was decided to build an experimental unit at Dartonfield. This smoke-house, while designed for a nominal capacity of only 700 lbs./day, is in certain aspects intermediate in construction between the R.R.I.M's 1,000 and 2,000 lbs./day units. It is therefore hoped that operational data of value for advisory work on both types can be acquired. The unit is 52' in internal length and equipped with 6 trolleys, the flue from the furnace entering the main building at the point corresponding to the position of the 'hot end' of the fourth trolley.

The theoretical attraction of a tunnel type smoke-house is that it attempts to deal with the published physical requirements of sheet drying, (*e.g.* initially a low temperature, say, 115-128°F, with a fairly high air circulation rate, followed as the moisture content of the sheets decreases by a gradually increasing

operating temperature), in a single building so that sheets from about $\frac{1}{7}$" to $\frac{1}{10}$" in thickness should dry in 3½-4 full days. The difficulty with such systems is that there are a large number of variables, (*e.g.* rate of firing, volume of air required inside and outside the arch of the furnace, the area of the flue to be left open under each trolley and the adjustment of the roof ventilators) which have to be correctly controlled to ensure economic production of an adequate temperature gradient.

The earliest experiments (C.P. 1846 p 13, 14) seemed to suggest that with a large number of settings of many of the variables mentioned above it was not possible to produce a temperature difference between the two ends of the smoke-house exceeding about 5°F, and under these conditions the area immediately over the point where the flue from the furnace entered the main flue was the warmest point. The experiments were continued using only 4 trolleys and with the short branch of the main flue blanked off. Under the appropriate conditions a temperature gradient of 15-20°F, but not more, could be maintained between trolleys No. 1 and No. 4 and initially about 1,200 lbs. of R.R.S.‡‡ 1 and 2 was produced at the rate of about 100 lbs./day. Sheets whose 'thickness' did not exceed 9 ozs. in weight per ft.^{2} could normally be dried in 4 days. Initially the temperature of the first trolley was set at 115-120°F, but this was later raised to 122-127°F without the appearance of symptoms of blistering.

The data obtained during the course of these experiments suggested that certain structural alterations to the smoke-house might be advantageous, and the contracting engineers have therefore (*a*) modified the outer casing of the furnace (*b*) moved the furnace further away from the main walls of the building (*c*) provided a total of three inlets from the furnace to the main transverse flue (*d*) uniformly deepened the original tapering transverse flue to about 20" and (*e*) deepening the internal drainage gutters for the dripped water. The principal object of these alterations was to ascertain whether the flue from the furnace could enter the main transverse flue anywhere between the mid-point and the hot end of the building without introducing difficulties such as restricted temperature gradient between the two end trolleys (as was found previously). The information at present available seems to suggest that under our conditions, even with the deepened main flue, it may still be preferable to arrange for the furnace flue to enter the main flue near the fifth or sixth trolley rather than near the centre of the transverse flue.

(6) Air Dried Sheet: R.R.I.M. Tunnel Type Smoke-House: As far as is known, high quality air dried sheet, when available in sufficient volume, often commands a substantial premium on the 'Singapore' market, although it can usually only be sold with difficulty in Colombo as it does not qualify for the China market. However it seemed desirable to confirm whether this product could be produced in tunnel type smoke-houses. According to our interpretation of the literature this has been done by taking steps to ensure that only the hot air passing between the metal arch furnace and the outer casing shall come in contact with the sheets, the smoke being led away in pipes. An alternative possibility seemed to be to connect a direct fired oil burner of suitable size to the main flue of the smoke-house, and a C.C.C. burner equipped with a fan has been connected to the centre of the main flue of R.R.I.C. tunnel smoke-house.

With an arrangement of this nature air dried sheets of excellent visual appearance can be produced provided that clean or well scraped reapers are employed. The sheets may be a little tacky but no adverse comment to this effect appeared in the Broker's Reports. Following the suggestions of the R.R.I.M. for air dried sheets, most of the sheets contained bisulphite and

p.nitrophenol. Sheets upto about 8½ oz./ft.² in weight could be dried in 4 days in the tunnel smoke-house with a maximum operating temperature of about 140-143°F at the hot end and a temperature of 185-200°F on the thermometer adjacent to the hot air fan.

The settings of the various flue outlets and of the ventilators etc. of the smoke-house are not the same as those used with smoked sheet and the metal arch furnace, and in order to maintain a reasonable temperature gradient in the smoke-house it appears to be necessary to restrict the ventilators and the flue openings at the cold end rather more than at the hot end. As noted above the flue from the burner enters the main flue near the centre of the latter, but this does not appear to prevent the establishment of a horizontal temperature gradient of at least 15°F. It is presumed that the differences in settings are due to the fact that the fan fitted at the rear of the burner provides a positive draught through the unit so that at least 1,000 ft.³ of air leaves the ventilators per minute. The air dried sheet was produced at a rate of 200-300 lbs./day and this rate could probably have been very substantially increased if additional latex had been available.

The procedure at present followed may not be entirely suitable on a commercial scale. The fuel oil used may contain about .03 per cent. of sulphur and it is not clear whether the gaseous sulphur containing combustion products may be absorbed by the drying sheets, and, if so, whether this is undesirable. Sample sheets are to be sent to the London Advisory Committee for comment and report on this point. The nozzle at present fitted to the burner is such that fuel consumption amounts to 25-28 gallons./day of 24 hours, and, with fuel at Rs. 0.79/gall., the drying costs are rather large in comparison with the smoking costs for R.S.S. The makers have therefore been contacted with a view to using smaller nozzles etc.

(7) Sheet Spacing etc. Preliminary experiments have been carried out to ascertain data for the shrinkage of air dried and smoked sheets during drying with a view to deciding whether it would be practicable to decrease the horizontal and vertical distance between reapers in the various experimental and permanent type smoke-houses available. It will be appreciated that the degree of closer packing theoretically possible depends upon the initial wet size of the sheet, that is upon the factory process, and that the degree of closer packing actually practicable will be expected to depend upon how far the circulation of the air is restricted. It is to be expected that restricted circulation, unless it is severe, may be of greater importance in the initial rather than in the final stages of drying. Various other tests have been carried out (C.P. 1846 p. 15 etc.) to relate the wet thickness in ozs./ft.² of R.S.S. and of air dried sheet to the dry thickness in the same units and to overcome the need to move and turn sheets during smoking.

3. 5. Bale Marking Compositions.—The replies received by the Department to a circular addressed to a number of Ceylon R.S.S. Packing Houses in 1951 suggested that the Packers did not consider that improved stencil inks were required for Ceylon's R.S.S. bales. While the correctness of the replies was sometimes doubted, it seemed in the circumstances rather unlikely that any useful work could be carried out on the subject of improving the packing and marking of Ceylon's R.S.S. More recently the Department has been advised that the marks made on material shipped to China are not invariably legible on arrival, and that sorting according to grades is not always easy in spite of the fact that different colours are employed for the different grade numbers.

Examination of some of the literature on this subject shows that the present R.M.A. specification clearly defines the quality and type of talc (no starch or glue)—natural rubber bale coating to be used and requires the bale marking to be done with natural rubber solution containing the appropriate pigments

or dyes. Dispersion of the pigment in these bale marking paints is apparently not easy unless the pigment is milled into the rubber prior to dissolution in the solvent, and, according to the literature, it is questionable whether these paints are entirely satisfactory. Heinisch and Wargadiwidjaja of I.N.I.R.O. (I.N.I.R.O. Com. No. 100 of Jan. 1954) noted that certain dyestuffs seemed to be able to penetrate through the bale coating and into the outer wrapper sheets and these authors developed a bale marking solution incorporating such 'penetrating dyestuffs'.

The formulae suggested by I.N.I.R.O. frequently required the use of rather inflammable solvents as well as the use of certain not readily available constituents and was accordingly simplified by Best and Lui of the R.R.I.M. (T.C. Note 6/54) and tested in trial shipments to Europe. However, even the R.R.I.M. procedure requires prior milling of the rubber with the dyestuffs and pigments as well as the incorporation of a small proportion of damar resin in the marking solution. In order to ascertain whether the Packers can make up their own marking solutions, various attempts have been made to make up marking paints containing only rubber and penetrating dyestuffs in mineral turpentine thereby avoiding the milling stage. Samples of waxoline type red, black, blue, green and yellow dyestuffs have now been received, but present indications are that not all of these are sufficiently penetrating to be useful.

Pending the arrival of these dyestuffs only a red material was available for preliminary tests (C.P. 1846 p. 16). Samples illustrating the advantages to be expected from the intelligent use of a suitably penetrating dyestuff were prepared and submitted to the Rubber Commissioner and to Messrs. Mackie & Co. Permission was obtained to mark (Order No., Weight Mark and Grade No.) a sample lot of 100 bales of R.S.S. ‡‡1 in Messrs. Mackie & Co.'s Rubber Stores using a mixture of an I.C.I. red waxoline dyestuff and a non-penetrating pigment in rubber solution. Permission to make a large obvious identification mark on a number of the faces of the 100 bales in the main consignment was refused and it seemed questionable whether the Chinese authorities would be able to identify the bales easily from the running numbers. The copy of the report of the Chinese authorities on these bales was not very promising, but it was apparent that there was, initially at least, some confusion concerning the size of the experimental consignment. Permission to repeat the experiment, with a modified paint, has been sought from the Rubber Commissioner. It should be pointed out that the marking solution is not intended for crepes, and that the bale coating beneath the marking solution should apparently conform to R.M.A. specification if proper adhesion is to be obtained.

Section IV—Blanket and Sole Crepe:

4. 1. General.—The volume of advisory work in this Section has shown a slight increase over the volume for the second half of 1953, presumably as a result of the rise in crepe prices. The various items of new crepe machinery bought on Estate Department votes were available for experimental use during a part of the period under review, but only limited work could be carried out due to other commitments.

4. 2. Machinery and Milling.—The full scale equipment at the R.R.I.C. now consists of a soft iron macerating mill, a chilled iron scrap macerating mill, an intermediate crepe mill with horizontal and spiral grooving, three smooth mills one of which is equipped with a 25 H.P. variable speed D.C. motor and a blanket crepe mill. The output and characteristics of the products of these mills will be determined in due course and it is intended to move the variable speed motor from mill to mill as circumstances permit. A direct comparison

of the soft and chilled iron macerating mills using the same bulk of coagulum should also be possible in due course. The only reliable data at present available concerns the diamond spiral intermediate mill which has been found to give the required width of intermediate blanket at a thickness which seems to be rather larger than is usual for sole crepe. After confirmatory tests Estate Department arranged to have the depth of the grooving diminished by the suppliers.

4. 3. Prevention of Mould on Crepe.—It has been the policy of the Department (vide item 2 of leaflet D/2 Ch of 20-2-53) that p.nitrophenol shall not be used in Ceylon crepes for the prevention of fungal staining and that the incorporation of fungicides in crepe shall not be encouraged until the chemicals concerned are approved by, for example, the London Advisory Committee or are known to be in large scale use in Malaya. Under these circumstances, it has therefore to be stated that the implication, which might be drawn from the last part of Advisory Circular No. 44 of 16-6-54, to the effect that p.nitrophenol may be used to suppress fungal staining in high quality crepes does not at present carry the approval of the Chemical Department and is not at present considered to be in agreement with the main weight of the evidence on this subject.

4. 4. Lamination of Sole Crepe Laces.—The information available on this subject has been written up during the period under review and the appropriate article is to be found in R.R.I.C. Quarterly Circular 1954 30-1, p. 1-8. It is unlikely that any further work will be carried out on this subject in the near future.

4. 5. Crepe Lace Solution Viscosity.—During the latter part of 1953 inquiries were received from the Agents for a crepe Estate concerning the supply of crepe laces, in 'book form', to a viscosity specification. The lace is believed to have been employed in adhesives work. As far as is known the Estate concerned had tendered representative samples of its production in 1947 and has, from time to time, being making shipments against the appropriate contract. However the shipments made against 1953 contracts were considered to be of too low viscosity by the buyers. The test evolved by the buyer is a crude time of fall type viscosity test, using a 3 per cent. (wt./volume) solution of the rubber in a light petroleum spirit, in which the intervals between manufacture and sampling and between solution and testing do not appear to be closely defined. It is relevant to point out that the experimental use of any correlation between Mooney Viscosity and solution viscosity would not be of much value in this case as the Estate concerned could probably not be expected to equip itself with a Mooney viscometer for this purpose.

Examination of the literature etc. led to the suggestion that a reduction in average viscosity might occur when the laces include excessive proportions of trimmings or cuttings, material containing much RPA. 3 or material from which a high per cent. of fraction has been removed. Examination of the factory processes by representatives of the Estate concerned led to the suggestion by the latter that the only significant process changes between the satisfactory shipments in 1952 and the unsatisfactory ones in 1953 was the introduction of RPA. 3 bleaching agent. More detailed examination of the correspondence made available to the Department suggested (C.P. 1846 p. 17) a more confusing overall picture. Accordingly, various tests were carried out on samples selected by the Estate concerned and at R.R.I.C. The information at present available seems to suggest that when the original viscosity is not greatly above the specification limit removal of a fraction, inadequate homogenisation of the original latex and excessive milling may be undesirable. The influence

of upto 12 ozs. of RPA. 3 per 1,000 lbs. d.r.c. is not clearly established in these tests and this is under further examination. On a tentative basis the Estate concerned has been advised not to supply 'remilled or cuttings' laces, bleached material or rubber from which a fraction has been removed.

Limited storage of certain subsamples of the experimental laces under various conditions not above tropical room temperature offered no reasonable explanation concerning why the invoices complained of should have failed to pass the test on arrival at the consumer's warehouse.

4. 6. **Wearing Qualities etc. of Sole Crepe.**—During the period under review a complaint has been laid by a buyer against about 240 cases of $\frac{1}{8}$" and 3/16" Ceylon Estate produced sole crepe on the grounds that part (only) of the material when made up in crepe sandals showed extremely poor wearing qualitites: a figure of about 1 week for the soles to wear through appears to have been mentioned. As far as is known, the crepe concerned had been bought by the shipper on the Colombo market in October, 1953 and had been made into sandals during January and February, 1954, the first complaints being received in March. Reference to our 'associated' organisations in Malaya and the U.K. concerning the characterisation and specification of sole crepe of good wearing qualities elicited the information that in general buyers (manufacturers) do not carry out routine tests before taking the material into use and that it appears questionable whether the exact characterisation of sole crepe of good wearing qualities is at present possible. On this basis it was tentatively assumed that the hardness of the material is normally expected to reflect its resistance to spreading during use (unless, perhaps, the content of 'active' copper, manganese or iron is unduly high) but that hardness may not have been proved to be a reliable guide to overall wearing (as opposed to working) qualities or that, if it has, there is no universally accepted specification limit.

On the basis of the examination of certain complaint samples, the R.R.I.M. appear to consider that the hardness (M5O) of good quality crepes should not be less than about 4 Kg/cm². Examination of 2 samples of the material sent back to the Colombo shipper showed M5O values above 5.0 Kg/cm² and later details from the buyers technical advisers suggest that the objections to the unsatisfactory material is apparently attributed very largely to the fact that the thickness is close to the lower limit of the tolerance believed to be permitted in the U.K. At the same time there is a comment to the effect that the acetone extract of the unsatisfactory material is .055 per cent. higher than that of the satisfactory material; it is not clear whether this difference is significant and, if so, whether it represents, for example, an excess of the active ingredient of RPA. 3.

As this is not the first complaint against the Estate concerned (which is now manufacturing R.S.S.) and as there is little data on the hardness values of standard Estate sole crepes in Ceylon, a suitable circular requesting representative samples of standard sole crepe has been despatched to Estates through their Agency Houses. The information available at present shows figures of M5O at tropical testing temperatures ranging from slightly under 4 to over 6 Kg/cm². It is intended to collect further samples at a later date prior to attempting to ascertain the causes of the wide variations in hardness between Estates. The London Advisory Committee have been notified that it may be possible to supply in due course samples of sole crepe with differing hardness values for actual wearing and other tests.

A limited amount of work has also been carried out on the subject of hardened crepes.

4. 7. **Bleaching by RPA. 3.**—As far as the Department is aware the use of concentrated RPA. 3 mentioned in the Report for 1953 has not become general in Ceylon. In the Report for 1953 attention was drawn to limited cases of discolouration of RPA. 3 when the latter was subjected to protracted storage in its original drums, and the suggestion that this chemical might with advantage be repacked on delivery into well washed and sealed glass containers was endorsed. During the period under review the Agents for this chemical and the R.R.I.C. have been advised that one glass carboy 'exploded' with total loss of its contents valued at Rs. 384/-. Reference by the Colombo Agents to the Malayan distributors of Emulsion 'A' Concentrate (*i.e.* RPA. 3+Duponol) suggests that examples of carboy breakage have been found in Malaya and that, in general, suitable portions of old bicycle tube valve are now incorporated in the rubber bung of the glass container to release any excessive pressure generated during storage or transport.

Many Estates in Ceylon are unable to convert even a slightly yellow latex into a good quality, non-discolouring crepe by the use of RPA. 3 unless a fraction is removed in the presence of sodium bisulphite. Recently it has been confirmed in Indonesia that an improvement in colour and in colour holding properties can be obtained if oxalic acid is used as coagulant in place of acetic or formic acids. There appears to be an implication that, at least in certain cases, both sodium bisulphite and removal of a first fraction might be unnecessary. Some preliminary small scale experiments with bulks of sligthly yellow and of markedly yellow (*i.e.* mainly TJ. 1) latex were carried out at Dartonfield early in the year.

The preliminary results with oxalic acid were quite promising and Agency Houses etc. were therefore notified that the material was available through Messrs. May & Baker, (P.O. Box 693) and through Messrs. Photocinex (Pharmaceuticals) Ltd. and that small scale trials might be worthwhile under certain Estate conditions. Further tests have now been put in hand at Dartonfield for confirmation purposes and provisionally this data seems to suggest that, with a white latex material, a good quality crepe can sometimes be made using oxalic acid and RPA. 3 without a fractional coagulation and without bisulphite. However, with a yellow latex material it seems doubtful whether a No. IX crepe, for example, could be made under R.R.I.C. conditions in the absence of a fractional coagulation even when the proportion of RPA. 3 is slightly beyond the usual upper limit. The data also seem to confirm that oxalic acid might be useful, (under certain conditions), in reducing brown discolouration. The quantity of oxalic acid used at coagulation at the R.R.I.C. is 10 lbs. (dissolved in 200 lbs. of water) per 1,000 lbs. d.r.c. and the cost of oxalic acid coagulation may be slightly higher than is found with conventional acids. There is evidence which suggests that the colour of the finished crepe may not be independent of the quantity of acid used. Nevertheless, small and medium scale trials (on Estates) with oxalic acid may be worthwhile (*a*) without a fractional coagulation at Estates where the latex is whitish and (*b*) under certain conditions at Estates where difficulties due to brown discolouration are marked. At this stage interested Estates should preferably test under their own conditions to ascertain whether sodium bisulphite can be omitted. It is believed that in addition to the above suppliers, oxalic acid is also obtainable through Messrs. Mackwoods.

Section V—Compounded Rubber—Technical Classification:

5. 1. **Equipment.**—All the equipment at present on order for technical classification work, including a second standard laboratory mixing and sheeting mill and a semi-micro mill, has been received. The relays on the D.C. Mooney Viscometer have had to be renewed and the scale on the strain tester repaired.

5. 2. General.—There seems to be less of interest to report under this head than in 1953. The anticipated total annual output of T.C.R. produced outside Ceylon continues to increase (48,260 tons in 1953 and an estimate of nearly 75,000 tons for 1954) and it would now appear that the lower grades of R.S.S., which are placed on the market by Packing Houses, will only be offered as T.C.R. in response to specific requests or firm orders. This procedure must be presumed to be the natural result of Packers' objections to carrying blending etc. costs, (estimated in Malaya at about 1·8*d*), on their limited margin. Various experiments regarding testing procedure have been carried out and the R.R.I.C. took part in a subsidiary rapid strain 'round robin' type test with the R.R.I.M. Under normal conditions the rapid strain test is not employed and all samples are now corrected for compound Mooney and cross-sectional area.

The policy of the Department remains that stated in the Annual Report for 1953, *i.e.* the Department shall, at present, act only in an advisory capacity rather than as a routine testing station for the commercial production of T.C.R. It is perhaps quite appropriate to make it clear that should the Department be required by the Board to act as a routine testing station, practically the whole of the Department's staff would be almost fully occupied with this work pending the engagement and training of new personnel. Similarly, while the equipment available constitutes, in effect, a single balanced T.C.R. unit, the capacity is not expected to be sufficient to deal with all of Ceylon's R.S.S.

5. 3. Technical Classification of Ceylon's R.S.S.—The procedure suggested to classify Ceylon's R.S.S. will depend inter alia upon the international policy in respect of the definition of technically classified rubber, the relative demand for each class of technically classified rubber and upon the size of the outturn of each R.M.A. grade from the producing or packing concerns involved. In principle the procedure adopted will probably include one or more of the schemes summarised below:—

(*a*) No. T.C. grading of producers' outturn; complete blending across and/or within producers' outturn, as required, by the Packers.

(*b*) Approximate T.C. grading of certain producers' outturn, where the R.S.S. might be blended (scrambled) within invoices; selected invoices from different sources being blended by the Packers according to the approximate T.C. grading and to the consumers' requirements.

(*c*) Carefully controlled production by certain producers to give restricted variation in technical classification properties between and within invoices or days; restricted or no blending across different producers invoices with baling by the producer or by the Packers.

Under all circumstances information showing what proportion of the R.S.S. is likely to lie outside the limits of the T.C.R. scheme will be desirable together with data suggesting whether this abnormal rubber can be blended with other R.S.S. Unfortunately, absolutely reliable information of this nature is not readily acquired, for unless the surveys involved are unduly large it is difficult to ensure that the sample sheets selected at Estates', Small-holders' and Packers' premises comprise a truly representative cross section of the total production. However by making certain assumptions, further information can be obtained from the R.S.S. selected for other purposes from large Estates (T.C.—B. 3, 4, 7 etc.), from small Estates and Small-holdings, (T.C.—D. 1, 2, 3) and from Packers' stores and the data at present available seem to be in agreement with the view that not more than 2-3 per cent. of the R.S.S. would

be expected to have normal strain values outside the limits 55 to 103. More data will be available when the results obtained in the second half of the year have been examined after statistical analysis.

The successful operation of Scheme (*a*) above presupposes that adequate information is available to show whether additional blending, *i.e.* blending beyond that normally carried out in process, is necessary and if so how it is to be carried out in practice. Information from Malaya and the data mentioned in the Annual Report for 1953 clearly suggest that additional blending will be necessary if a high proportion of the outgoing consignments of R.S.S. are to be offered as T.C.R. Further experiments in 1954, using R.M.A ‡‡.2 bales loaned by a Packer and blended at the R.R.I.C. (T.C.—C. 3), seem to confirm that while some blending takes place during normal grading in the Packer's Stores, the degree of blending is not invariably sufficient for the production of T.C.R. Information on the degree and method of blending likely to be required can be obtained either by examination of the sources of the variability which have to be blended out or by actual large and small scale trials. The surveys mentioned above will be expected to give some further indication of the range of mean strain values of the output of the various producing units and it may be possible to suggest whether R.S.S. from large Estates can be blended with Dealers R.S.S. without too complicated procedures and without the need for excessive storage facilities. In this connection it will be noted that the problem would be greatly simplified if all large Estates could produce relatively uniform R.S.S. whose mean strain would be, for example, near the centre of the yellow (central) T.C.R. class, and it is hoped to examine the subject of 'level changing' from this aspect in 1955. More information is available in the case of Dealers' and Small-holders' R.S.S. primarily as a result of surveys (T.C.—D. 1, 2, 3) in which the samples were collected by S.H.P.O.'s staff, and, unless the blending achieved before arrival of the R.S.S. at the packing house is likely to be particularly good, the tentative conclusions drawn (C.P. 1846 p. 21) were that, when the Dealers' lots are large and comprise almost entirely Small-holders' R.S.S., the prime requirement for uniformity between bales would probably be blending within dealers' lots *i.e.* by taking for sorting, grading and baling a small number of sheets at a time from a large number of piles in turn within the Dealers' lot, etc, etc; but when R.S.S. from small Estates is included in the lot, or the lot is small, or is drawn solely from a single area or district, then blending between Dealers' lots as well as across piles would probably be required. It is hoped to repeat some of these surveys in 1955. The procedure of taking a few sheets at a time from 6 to 9 different initial sources (*i.e.* different piles of Dealers' R.S.S., or different Estates' R.S.S.) to build blended bales is being examined in more detail both at R.R.I.C. and in the Packers' stores.

The assumption underlying Scheme (*b*) is that certain large Estates might not produce R.S.S. whose mean strain lies near to the mean likely to be usually encountered in blended bales made from Dealers' R.S.S., so that, if the volume of the Estate's invoice is large, difficulties in producing a large uniform consignment of T.C.R. might be encountered. Under these circumstances the Estates' R.S.S. could be given an approximate grading mark and blended accordingly. Whether such a procedure is necessary will naturally depend inter alia on the range of strain values likely to be encountered, the size of the Estate's invoice, the size of the Packer's consignment and the volume of other material available for blending. Some information on the range of mean strain values for Estates is available and additional data is being collected. As noted above this scheme might not be employed if 'level changing' is easily and cheaply accomplished. However orders for consignments of T.C.R. whose mean strain is not near the mean strain of blended Dealers' R.S.S. could probably most easily be met by selection of R.S.S. from previously graded Estates. At present a limited number of Estates are being sampled at

irregular intervals and it is hoped that the output of many of these Estates and the bales produced from approved blended Dealers' lots could be offered on an experimental basis as T.C.R. without excessive difficulty.

Section VI—Miscellaneous:

6. 1. Copper Content of Rubber.—It is well known that the presence of quite small quantities of copper and manganese in an 'active' form can accelerate the decomposition of raw and vulcanised dry rubber and of concentrated latex. Under certain conditions particularly with latex, the adverse influence of 'active' copper can be reduced by the introduction of appropriate chemicals, for example, during mixing for vulcanisation. However, such chemicals could not readily be introduced into stockpile material and the R.M.A. Inc's 'Type Descriptions and Packing Specifications for Natural Rubber' now contains a clause to the effect that the copper or manganese content of any natural rubber tendered against any R.M.A. type and grade shall not exceed 8 and 10 parts per million respectively. In the case of concentrated latex the appropriate figure for copper is 10 p.p.m.

Examination of the R.R.I.C. correspondence did not suggest that there was much recent data on the copper content of the standard Estate and Smallholding products and, as indicated in the Annual Report for 1953 (p. 31), various small scale surveys and other tests have been put in hand. The copper content of fresh field latex is not negligible and, although the information on this aspect of the subject with respect to Ceylon, is limited, it is anticipated from the literature that a large proportion of this copper will be lost during process *e.g.* in the serum and during milling. Further 'contamination' may take place during packing or transport, and it will be remembered that certain producing territories appear to have found it economically desirable, under their present and anticipated future conditions, to undertake trials with copper sulphate as a yield stimulant. While there is evidence in the literature to suggest that the correct use of copper sulphate as a yield stimulant need not necessarily give rise to an undesirable increase in the copper content of the producers' finished material, simple calculation will show that careless handling (cf various articles in the R.R.I.M. Planters Bulletin New Series) could give rise to an unduly high copper content in latex and/or scrap. Similarly at the present state of knowledge of this subject, some care may be needed on rubber or on tea cum rubber Estates when sprays containing copper salts are used as fungicides or to combat proven or suggested cases of copper deficiency. The standard R.R.I.C. booklet 'The Preparation of Plantation Rubber in Ceylon' contains a comment (1943 Edition, para 21, p. 7) to the effect that brass gauze strainers should not be employed.

While a large scale survey is beyond the resources of the R.R.I.C., various Estates, Packers' Stores and Small-holdings were sampled in 1953 and the table below has been drawn up from the copper content figures obtained on analysis by the Research Assistant.

Type of Material	Copper Content p.p.m.		Standard Deviation of Samples	No. of Samples Tested	Date of Collection
	Highest	Average			
Large Estate RSS ‡‡ 1	1.3	.87	.20	16	Oct. Nov. '53
Smallholders RSS ‡‡ 1, 2	4.1	1.51	.85	35	July '53
Packers RMA ‡‡ 3	3.6	1.94	.72	12	Nov. Dec. '53
RMA ‡‡ 4	2.6	1.32	.75	12	Nov. Dec. '53
RMA ‡‡ 5 Black pieces or bits only in Sheets	17.1	11.5	—	3	Nov. Dec. '53
Blanket ex 1st Fraction	3.4	1.82	.70	31	July '53
Blanket ex Trimmings	2.0	1.21	.60	15	July '53
Unsatisfactory Remills ex outside Ceylon	24.3	21.2	—	2	—

The data refers to only 89 samples of Ceylon R.S.S. and to only 46 samples of Ceylon blanket and it is well known that accurate and reproducible estimation of small amounts of copper, *e.g.* under 10 p.p.m., is not easy, so that any conclusions involving the assumption that the figures are typical of standard Ceylon sheet or crepe must be accepted with caution. However, it will be noted that, with the exception of the dirty pieces specially selected from R.M.A. ‡‡ 5 sheets, the copper contents do not approach the specification limit, and that, if the samples are reasonably representative and the distribution is normal, the proportion of similar test pieces whose copper content would exceed 8 p.p.m. will be expected to be extremely small: alternatively if the mean values are low by, say, 50 per cent. or if the distribution is not normal, the proportion of the test pieces failing to meet the specification would not be expected to be very large.

Further samples of R.M.A. ‡‡ 1 to 5 sheets have been drawn from Packers' Stores in 1954. Preliminary examination of the data confirms that samples containing black specks or dirty pieces cut from R.M.A. ‡‡ 5 can show copper contents above 8 p.p.m., but that this is by no means usual and that the copper content of dirty pieces does not always exceed the figure found for the 'homogenised' sheet. None of the sheets of R.M.A. ‡‡ 1 to ‡‡ 4 tested to date have shown copper contents above 8 p.p.m. A limited number of concentrated and field latex samples are being examined and various tests were carried out in the initial stages of the work on the methods suggested for the determination of copper in rubber. With the kind assistance of the Firestone Tire and Rubber Co. (Straits Settlement) Ltd. of Singapore a Firestone's Rubberscope has been obtained.

6. 2. Disposal of Factory Effluents.—The Research Assistant has continued to carry out a programme of work on this subject. The principal object of this work is to investigate, primarily on a small scale, the application of certain standard wastes disposal methods to raw rubber factory effluents. As noted previously (Annual Report for 1953, p. 29-31; *et al*), the information obtained might be of immediate value to limited numbers of Estates and may be of more general applicability at a later date when stringent legislation against stream and river pollution might be enforced. Basically, three main systems have to be considered (*a*) the destruction of effluent from normal process raw rubber factories, that is effluent containing little or no rubber and varying amounts of water, (*b*) the destruction of effluents which have, at some stage, been heavily ammoniated and which may contain some rubber and (*c*) the destruction of effluents containing larger amounts of rubber. To date only the latter has received little or no attention, and only microbiological processes have been investigated.

Examination of some of the literature on standard trade wastes disposal systems shows that the procedure adopted under a given set of conditions will depend upon the 'pollution load' of the effluent from the various stages of the manufacturing process involved, the presence of substances which are toxic per se to plant and/or animal life rather than through their high B.O.D. and upon the availability of dilution water etc., etc. In 1953 a small scale (40 gallons) anaerobic decomposition unit, various settling tanks and a limited number of small aerobic percolating filters were built and set in operation. The preliminary experiments suggested that, once the various microbiological destruction units were fully 'acclimatised' to their various raw materials, substantially undiluted serum (1/0 to 1/3) could be decomposed by an anaerobic process followed after sedimentation by an aerobic process to provide a final effluent in which a number of common Ceylon stream fish could survive without apparent difficulty for at least 14 days, provided the final effluent was diluted with four times its own volume of water. To summarise, these

preliminary trials showed that standard process serum could be decomposed biologically and suggested that the proportion of substances toxic to fish left in the final effluent was probably not large.

The process mentioned above was in continuous operation for at least six months in 1954 and in addition to adding further small scale units some limited data on the reduction in B.O.D. at each stage has been collected. Provisionally, it would appear that the initial B.O.D. (in p.p.m. in all cases) of substantially undiluted crepe serum may be in the range 1.3×10^4 to 1.6×10^4; where the serum is diluted by flooding the tanks of coagulum or by standardisation at a lower figure (as for R.S.S.), the initial B.O.D. can be in the range 3.2×10^3 to 1.1×10^4. After anaerobic treatment (5 days retention) and settling, the B.O.D. of the corresponding effluent may be in the range 6.6×10^2 to about 4.4×10^3 representing on the average a B.O.D. of about 15 to 30 per cent. of the original serum. Settled anaerobic effluent diluted to a B.O.D. of, for example, 535 can be reduced to a final value of below 40 by one pass through each of two small percolating filters operating in series. The exact relation between B.O.D. reduction, in terms of lbs./yard^3 of filter/day, and flow rate, in terms of gallons/yard^3 of filter/day, for normal serum after anaerobic decomposition is still under investigation.

Examination of the literature suggests that while an initial anaerobic decomposition stage may be required for effluents with high total solids this step may not be desirable or necessary for liquids whose initial B.O.D. is, for example, under 5,000. Simple calculation suggests that the B.O.D. of the effluents obtained from the nip of the mills used in the later parts of the crepe processes will not approach 5,000 p.p.m. and various tests involving serum, diluted to B.O.D. figures in the range of 500 to 1,000 and passed through aerobic percolating filters at flow rates between 20 and 60 gallons/yard^3 of filter/day, are nearing completion. While it is apparent that the filters take considerable time to become 'acclimatised' to the raw serum, little technical difficulty is likely to be experienced in the production of a final effluent with a B.O.D. of only about 20 p.p.m.

During 1954 some preliminary tests have been carried out on the serum obtained from the 'skim' coagulum tanks of centrifuge concentrated latex. Most of the samples of the raw material have been obtained from Messrs. The Latex Corporation of Ceylon Ltd. The samples tested on arrival at R.R.I.C. showed initial B.O.D. figures in the range 2.0×10^4 to 2.4×10^4, that is appreciably above the figures for crepe serum. After treatment with lime and aluminium sulphate and sedimentation, the B.O.D. of the central portion of the sedimented liquors showed figures in the range 1.8×10^4 to to 2.2×10^4. Accordingly skim serum has been submitted to anaerobic followed by aerobic destruction using the equipment employed for crepe serum. While the process can undoubtedly be applied to skim serum and a final effluent of not more than 65 p.p.m. B.O.D., for example, has been produced, the individual stages may not be quite so efficient as is found with crepe serum. Thus the anaerobic stage process with a 5 day retention may not give more than a 50 per cent. reduction in B.O.D. The aerobic treatment of diluted and settled skim serum may be studied in more detail later.

REPORT OF THE BOTANICAL DEPARTMENT FOR THE YEAR, 1954

By

C. A. de Silva

SUMMARY

Plant Breeding:

The planting material in the form of clones and clonal seedlings which have been developed since 1939, has now accumulated to approximately 400 acres of experimental plantations. The recording of growth and yield figures and the periodic scrutinising of these figures by the staff at Dartonfield constitute the major part of the work of the Botanical Department.

A small scale pollination programme was carried out in 1954, under the supervision of the Plant Breeding Officer.

The early selection of promising clones from large scale clone trials with a limited number of trees of each clone has proved to be very successful. The high correlation between early yields and those given in later years, already indicated by the Morris Mann System in the case of clonal seedlings, can be expected to be more reliable in the case of budded rubber, where the early selections of high yields are made in the first year of normal tapping. The policy of multiplying the budwood of the best of these early selected clones and planting these out in 4 to 5 tapping tasks of each clone is highly desirable if early recommendations are to be made to the industry for planting on a commercial scale. At the same time budwood of these clones is supplied to estates, for trials on a small scale. These plantations while making substantial contributions to the average estate yields from high yielding clones provide the final information on the variations in yields that can be expected from the rubber planting districts of Ceylon.

Experimental tapping based on commercial tapping tasks of the new RLD clones will be taken twice a month and general observations will be made on growth and secondary characters. The general estate results on commercial tapping from these plots will provide final confirmation of the potentialities of the selected clones. In the past the most carefully conducted large scale clone trials with a limited number of trees of each clone have failed to supply the answer for final recommendations, which are acceptable to the planting industry. The statistical layouts of large clone trials for preliminary indications on which early selections are based, especially on growth characteristics, are appreciated. There is evidence that the highest yielding trees are the best grown in the case of budded rubber.

Performance of local Nab Clones:

Clones Nab 12, 15, 17 and 20 continue to give yields of the same order as clone PB86; the differences in yield in 1954 are within the errors of experimentation. Clone Nab 17 has been planted in boundary areas and in the 'hedge' planting experiment at Hedigalla for final observations on its apparent susceptibility to Brown Bast indicated in the 1939 trial. These clones are recommended for planting on a small scale on commercial estates. The standard of these final selections is indicated by the general estate yields recorded for the 1939 clearing in 1954 of 1,013 lbs. dry rubber per acre. There are 19 other Nab clones in this area.

Foreign Clones:

Clones AVROS 255, 352 and RRIM 501 have given good yields in 1954 with AVROS 255 heading the list in the trial concerned. There are some indications of susceptibility to Brown Bast and wind damage in all these clones. Clone PR 107 shows high yielding characteristics, which justify recommendations to plant these clones on a commercial scale; clone PR 107, which is now being planted on a large scale is somewhat resistant to Oidium and has good bark characteristics. Clones PB6/50, Lun N, and RRIM 513 have also given high yields, which warrant further consideration for planting these clones commercially on a smaller scale. The above selected clones together with the other foreign and local clones on trial in the 1940 clearing at Nivitigalakele have given a yield of 1,000 lbs. dry rubber per acre in 1954. Clone PB86 has been planted as a control clone in experimental clearings and there is little doubt that at the present time it is the most reliable clone for large scale planting.

Clone LCB 1320 has been tapped in the 1946 clearing at Nivitigalakele Estate, the early yields indicate that the clone is high yielding, and can now be planted commercially on a limited scale.

Clonal Seedlings and Budded Rubber:

Seedlings of Clone Tjir 1 (selfed), PB 5/139, and hand pollinated seedlings of special crosses which have been selectively thinned out on the results of the Morris Mann System of early tapping from 260 to 160 points per acre have given yields which are very promising compared with those of the budded Control Clone Tjir 1. Illegitimate seedlings of clone PB86 in the same experiment have given poorer yields than those of clone Tjir 1 or the other seedling material represented. Seed of clone Tjir 1 is more readily obtained in Ceylon than any other type. There is evidence that clone PB86 crossed with other reliable seed plants can produce some individual high yielding clonal seedlings, especially with clones Tjir 1, Wag 6278, Mil 3/2 and RLD 8; a limited amount of such crosses of PB86 seed has been permitted in mixed clonal seed collections.

New Clones in the RLD Series:

The RLD clones are final selections from five and three tree clones established from Prang Besar isolated Garden and hand pollinated seedlings. Clones RLD 28 and 41 have given just over 30 lbs. dry rubber per tree in 1954 in the 4th tapping year. Clone RLD 36 has given 29 lbs. per tree per year in the 3rd tapping year. Clones RLD 9, 16, 19, 22, 29, 30, 31, 33, 37, 38, 39, 42, 45, 46, 47, 48, 49 and 51 have given yields ranging from 19 to 25 lbs. dry rubber per tree in 1954. The high yields of all other RLD clones have justified the selection made in first and second years of test-tapping. The areas with hand pollinated seedlings and a major number of RLD clones have given high yields per acre under commercial tapping, especially in the 1941 clearing at Nivitigalakele Estate, which has given 1,225 lbs. dry rubber per acre in 1954. Clones RLD 1, 2, 4, 5, 6 and 7 have been tested on a larger scale for a number of years. The 1954 results confirm the high yielding qualities of these clones which have been planted on a semi-commercial scale at the Hedigalla Division in 1953.

Budgrafting:

(1) Results in the first three years of tapping have shown no yield differences in budgrafts established from main stembuds and branch buds. The latter are used in normal budgrafting for commercial planting. The five tree clones established from two year hand pollinated seedlings are budgrafts of the main stem bud type.

(2) Further test-tapping of two series of budgrafts established from the highest and lowest yielding of 52 Mil 3/2 trees have confirmed that environment and variability of stocks have no effect on the genetic characteristics of a clone. Budwood can, therefore, be propagated from any authenticated tree of a particular clone irrespective of its growth and yield characteristics in a particular environment.

Crown-Budding:

The crown-budding in this area was unfortunately delayed owing to the war and the high budding was carried out when the clones were 4 years of age.

A mean grith of 20 inches was obtained over the whole area in approximately ten years. Crown-budding should be carried out ideally after 18 to 24 months growth of the budgrafts.

The average girth for centre-sections crown-budded at 5 feet and 8 feet remained the same.

On three months tapping in 1954 the average yields of centre-sections crown budded at a height of 5 and 8 feet show no differences. These results are only tentative at present. The effects of high and low yielding crowns on budded centre-sections will only be available when the whole area is in tapping in 1955.

'Hedge' Planting:

In a 'hedge' planting experiment of 31 clones on 34½ acres, spaced 6′×45′, twenty one clones have reached an average girth of 16 inches and over at 5½ years of age on very hilly land.

The better known clones PB86, RRIM 501, RRIM 513, PB 6/50, Nab 17 and Nab 20 show an average girth of 17.4 inches at 5½ years of age, which is very satisfactory. Bark measurements of these clones taken round the main stem at a height of 3 feet show no differences in bark thickness.

Clone RLD 52 one of the most vigorous growing clones, yielding 13 lbs. dry rubber per tree per year in a 1944 small scale clone trial shows an average girth of 20.2 inches, at 5½ years of age in this 'hedge' planting experiment. This clone is also under observation for resistance to Oidium leaf disease.

At the present stage we have recommended 'avenue' planting 8′×30′ on a commercial scale. In other countries there are indications that about 7 feet would be the minimum distance in the rows for rubber alone. Hedge planting can be adopted for rubber with subsidiary crops, like cocoa and coffee.

Preliminary yield results will be available in 1955-56.

No cases of wind damage in this experiment have been reported in 1954. 257 trees were damaged after a storm in the other areas in Hedigalla Estate.

New Planting in 1954:

148 acres of new planting were completed in 1954. Selected RLD clones were planted in mono-clonal blocks of approximately 5 acres each, which can be later tapped on 4 tapping tasks. Clones IRCI 10 and RRIM 501 were planted as controls.

A small scale clone trial of 200 trees each of five new Prang Besar Clones and two IRCI clones No.'s 7 and 10, were planted on Nivitigalakele Estate. Clone RRIM 501 was planted as a control.

Importation of Planting Material from Foreign Sources

Following an agreement at a meeting of the 'Far East Directors Liaison Committee' at the Bogor Conference in Indonesia early in 1954, the exchange of 20 clones with each of four Research Stations in Indo-China, Malaya, Java and Sumatra was successfully completed in 1954. 80 of the better known clones of foreign countries were successfully established in the nurseries at Nivitigalakele. The clones concerned are listed in Table XIX in the detailed report below.

Export of Clones:

In addition to the material exported on an exchange basis described above budwood of the following clones were desptached to Australia for use in New Guinea at the request of the Australian Government and on behalf of the Ceylon Government:—

Nab	12, 15, 17, 20
AV	49, AV. 255
LCB	870

DETAILED REPORT

Staff:

The staff of the Botanical Department remained the same as in 1953, with the following officers on duty throughout the year:—

Mr. C. A. de Silva, Botanist, acted for the Mycologist from May, 1954 in addition to his own duties.

Mr. L. Wijeyegunewardene, Plant Breeder.

Mr. L. B. Chandresekere, Research Assistant.

Mr. W. G. V. Fernando, Laboratory Assistant and Computer.

Mr. C. Amaracone, Laboratory Assistant—continued work on the Nivitigalakele Sub-station.

The field experiments on Dartonfield, Nivitigalakele and Hedigalla Estates are supervised by six Experimental Conductors and trained sub-staff assistants who work under the direct control of the Estate Superintendent and whose services are shared with other departments.

Advisory Work:

The correspondence in connection with general advisory work continues to take up a considerable part of the time of the writer. During the latter half of the year the negotiations in connection with the importation of planting material from four foreign sources added to the general correspondence. The publication of a number of Advisory Circulars in recent years has helped considerably in reducing the correspondence. The appearance of a class of newly interested estate proprietors replanting under the Government Subsidy Scheme has given rise to a series of queries on the whole of the rubber planting procedure in a single letter. To meet this special demand in advisory services, it will be necessary to have a combined publication of selected advisory circulars. A considerable number of these applicants for general advice are in the category of middle-class and small-holders, who are in many instances referred to the Small-Holdings Propaganda Officer.

Inward correspondence	...	660
Outward correspondence	...	692

Visits:

63 visits were made to three experimental stations in connection with field experiments, nurseries and distribution of budwood, 13 advisory visits to outside estates and 13 visits to Colombo in connection with the exchange of planting material with outside countries.

Leave:

14 days vacation leave were taken in two periods during the months of August and December, 1954.

Publications:

1. Advisory Circular No. 40 on the 'Tapping of Hevea Rubber' superseding Circular No. 34.

2. Advisory Circular No. 42 on the 'sale of budwood'.

FIELD EXPERIMENTS

Detailed Report:

As in former years the field work of the Botanical Department has been mainly confined to the recording of growth and yield data in the various clearings, which have been planted since 1941, with clonal seedling families and clones established from the major proportion of these seedlings.

The method of making selections of the better yielding clones in the first year of tapping has been very satisfactory, and the results presented in this report justify this policy. In fact this early selection is very similar to that of clonal seedlings for high yields on the Morris Mann system of early tapping. Clones selected on the first year of normal tapping can be expected to show higher correlations with yields in subsequent years than the systems of early tapping on immature seedling trees, which are genetically dissimilar.

Experimental tapping of clonal seedlings and 5 tree clones have been carried out on 7 of the 9 outside estates, on which 5 acres blocks have been planted under the superivison of the Institute. This work in 1954 has been supervised by the Plant Breeding Officer with the help of a visiting field staff.

Growth measurements are presented in the case of immature clearings from the end of the second year of growth. Bark measurements are taken about the 8th year of tapping, when a comparison between virgin and renewed bark is of practical value. In the older areas the cases of Brown Bast and wind damage are recorded for individual clones and seedling families.

The yields in the more mature areas are given in pounds dry rubber per tree per year, based on 280 tapping days. In this country where unfavourable weather conditions interfere with normal tapping more than in other countries, the yields based on 140 tappings on a two day system and 94 tappings on a three day system give a more realistic comparative estimate of the yields of clones and clonal seedlings. These results are more directly applicable to commercial plantations. The test-tapping is carried out by trained field staff with ten to fifteen years experience.

In 1953 and 1954, 274½ acres on Hedigalla Estate have been planted with selections of new RLD clones on a semi-commercial scale, together with control clones, which have been recommended for large scale planting. The plans and books for recording growth and yield figures will be completed during the first two years of growth. These areas are maintained under the supervision of the estate department.

Observations on crown-budding and 'hedge' planting have been continued on two large scale experiments, and most useful early records on growth and yield are presented in this report. The field numbers on Nivitigalakele Estate are revised according to a new classification of field by the estate department.

The results for the year are presented for the three experimental stations on Dartonfield, Nivitigalakele, and Hedigalla estates, which serve as a permanent record for the supervising staff and newly appointed staff officers. At the same time it gives the necessary information as concisely as possible to the planting public, administrative boards and scientific institutions interested in the crop.

Dartonfield Estate

1941 Replanted Area, 6½ acres, Field No. 5 Dartonfield:

Test-tapping was continued on this area planted with 5 clones of the first selection of ten R.R.I.M. clones sent from Malaya. Clonal seedlings representing illegitimate seedling families used as stocks in this experiment have also been tapped for comparison. The yield results from 1951 to 1954 are summarised in Table I.

TABLE I

1941 Replanted Area RRIM '500' Series
Tapped S/2, d/2, 100% First tapped in March, 1948
Yield in lbs. per tree, per year, tapped S/2, d/2, 100%

Clones	RRIM 500	RRIM 501	RRIM 506	RRIM 520	RRIM 514	Clonal Seedlings
*No. of trees tapped 1954	78-96	69-94	40-77	69-99	82-112	90-97
Yield						
1951	10.2	17.2	10.3	9.7	6.5	8.9
1952	7.2	14.9	8.0	8.7	6.1	8.1
1953	10.6	17.1	14.7	10.6	10.3	11.3
1954	10.6	17.4	10.4	9.7	9.1	11.3

*Tapping on the increased numbers of trees started in February, 1954.

From February, 1954 all trees affected with Brown Bast and still in tapping were taken into experimental recording. This procedure has resulted in reduced yields in some clones compared with the yields in 1953, especially in clone RRIM 506 which has a high percentage of Brown Bast trees. Clone RRIM 501 continues to give very encouraging yields, and its high yielding qualities are further confirmed in the 1940 clearing at Nivitigalakele Estate, under less favourable conditions of growth. Clone RRIM 501 has been recommended for large scale commercial planting. The clone is however fairly susceptible to Oidium leaf disease and requires adequate control by sulphur dusting for obtaining the best results.

Clonal Seedling Trial, 1947 Area, Field No. 6 Dartonfield:

This experiment provides for a comparison of clonal seedling families with a budded control clone Tjir 1.

The experiment consists of 8 replications each of 4 types of clonal seedlings and clone Tjir 1 in 30 tree plots. The boundary areas were planted with seedlings of clone Glen 1 collected from a monoclonal block.

The material planted is as follows:—

(1) Tjir 1 (selfed) collected centrally from a mono-clonal block on a commercial estate.

(2) PB 86 illegitimate seed collected from PB86 area on a commercial estate, the seed includes a considerable number of crosses with clone Glen 1, which is not a reliable seed parent.

(3) PB 5/139 seed from Dartonfield Estate, ground picked from 30 trees surrounded by clones AVROS 255, BR 2 and AVROS 163.

(4) A collection of H.P. seedlings representing the produce of a hypothetical seed garden, with clone parents Tjir 1, BR 2, AVROS 163, and AVROS 255.

The trees were selectively thinned out from 260 to 160 trees per acre in July, 1951, based on the Morris Mann System of early test tapping was carried out twice a month on a plot basis in 1954. The d.r.c. figures were calculated from a 50 c.c. sample from each plot yield. The results are presented in Table II.

Seed of clone PB86 has given definitely poorer results than Tjir 1 seed or other material in this area. There is, however, evidence in the results obtained from PB86 hand pollinated seedling families in the 1943 clearing at Nivitigalakele and the 1946 and 1947 clearings at Hedigalla that clone PB86 can produce some promising individual seedlings from among the crosses made with a wide range of local and foreign clones.

In general the planting of PB86 clonal seed on any scale should be discouraged, especially as there has been a tendency to make large collections from within monoclonal blocks of clone PB86 in this country. Such seed is definitely unreliable for large scale commercial planting at this stage; when little is known of the performance of illegitimate or 'selfed' seed of clone PB86.

Both PB 5/139 and H.P. seedlings in this area have given better yields than Tjir 1 clonal seed. This seed is, however, not available on a commercial scale.

69 illegitimate seedlings of clone Glen 1 planted out at the same time in boundary areas of this clearing have given an average yield of 21.6 grams d.r.c. per tree per tapping in 1954 which is also higher than that from the PB86 seedlings.

The general estate records show a yield of 556 lbs. d.r.c. per acre for 1954 from the clonal seedlings and budded material in this area, tapped on a 67 per cent. intensity. All trees will be tapped on 100 per cent. intensity in 1955.

The usefulness of the Morris-Mann System for the selection of high yielding seedling material about the fourth year of growth is again confirmed by the correlation coefficient (r) given below for three years.

TABLE II

1947 Replanted Area, Dartonfield Clonal Seedling Trial

Tapped on S/2, d/3, 67%

Trees first tapped in 1952

Planting material	Yield of clonal seedlings				Yield of budded Tj.1	Mean	Error	Sign. diff. (.05)
	TJ.1	PB.86	PB 5/139	H.P. Seedlings				
Morris-Mann yield for 5 tappings in grams d.r.c. 1951 ...	24.1	18.2	30.4	29.8	Not tapped	—	—	
Yield per tree/tapping 1952 ...	10.0	8.5	14.8	15.1	19.5*			
Yield per tree/tapping 1953 ...	15.3	13.2	20.3	21.6	20.2	18.1	0.78	2.3
Yield per tree/tapping 1954 ...	25.1	18.3	29.4	32.5	27.6	26.6	1.06	3.1

*Tapped September to December only

	1952	1953	1954	*Significant* r (.01) *level*
Correlation coefficient (r) ...	.7585	.6911	.7008	.4487

1950 Replanted Area, 23 Acres, Dartonfield:

This area was planted in August, 1950 with five tree clones established from a proportion of the 1945 hand pollinated seedlings planted out in the 1947 clearing at Hedigalla. Girth measurements were taken in December, 1954, excluding a large number of late supplies in this area, which was badly affected with (*Fomes*) *Leptoporus lignosus;* the average girth of trees was 14.1 inches in 1954 at 4½ years of age. This growth is quite satisfactory.

1950-51 Replanted Area, 5 Acres, Dartonfield:

This area is a continuation of the 1950 replanted area of 23 acres, which was planted with five tree clones established from the 1945 H.P. seedlings in May-July, 1951. The average girth of trees in December, 1954 was 9.7 inches at 3½ years of age.

1952 Replanted Area:

Clones Nab. 12, 15, 20, RRIM 501, and PB 86 are planted in this area in 200 trees plots replicated in 5 blocks. The boundary areas were planted with clone Nab. 17. This clone although high yielding is somewhat susceptible to Brown Bast, these boundary areas will supply further information on the performance of this clone. Girth measurements were taken in July-August, 1954.

The planting distance was 9′×30′; compared with the square planting in the 1950 and 1951 areas at Dartonfield, this planting resulted in an average girth of trees of 6.4 inches at just over 2 years of age. This is very satisfactory. It should be remembered however that the rate of growth is also influenced by the hereditary characteristics of each clone and girth development cannot be wholly attributed to any particular planting distance or cultural operations.

Nivitigalakele Estate

1939 Clearing, Field 5, 10 Acres, Nivitigalakele:

This clone trial originally consisted of 37 clones. The test-tapping of 8 selected clones and 3 control clones was continued in 1954. The yield figures indicated that clones Nab 3, 8, 11 and 16 are of no further interest. The yield results of clones, which are retained for further test-tapping are given in Table III.

The four Nab clones show increased yields in 1954 and with allowances made for errors of experimentation compare well with those of the control clone PB 86, which is partially resistant to Oidium leaf disease. With better refoliation in recent years the yields of the Nab clones have recovered considerably. Clone Nab 17 has been planted in a large scale 'Hedge' planting trial at Hedigalla and further information will be available from 1955 on its susceptibility to Brown Bast. At present clones Nab 12, 15 and 20 are the more promising for trial on a commercial scale. 6 acres of each of these clones have been included in a large scale clone trial planted in 1952, at Dartonfield. Half the number of trees in each clone was tapped on 9 year old renewed bark in 1954. The yields indicate a drop in yield on renewed bark. Clone PB 86 indicates a drop of 12 per cent, while the Nab clones show reduced yields from 14 to 27 per cent. This is not surprising as the bark in the Nab clones has renewed under poor foliage conditions in the past due to inadequate control of Oidium. It would be premature however to generalize on these early results from a small scale trial.

TABLE III

1939 Clearing, Field 5, Tapping System S/2, d/2, 100%

Trees first tapped in 1945

Clone	No of trees tapped 1954	Yield in lbs. d.r.c. per tree per year 140 tappings						Brown Bast cases	Wind damage cases	Colour of rubber in crepe
		1949	1950	1951	1952	1953	1954*			
Nab 12 ...	19	13.3	15.1	15.4	17.4	16.9	18.0	5	1	Pale yellow
Nab 15 ...	20–18	15.9	15.0	14.7	13.6	14.7	16.5	3	–	Pale yellow
Nab 17 ...	19	15.2	14.9	14.2	15.6	16.0	17.1	8	1	—
Nab 20 ...	15–11	15.5	16.7	14.6	18.4	15.6	16.3	5	5	Pale yellow
Control PB 86 ...	20–19	13.2	13.0	15.3	17.3	17.6	18.3	2	–	White to pale yellow
(WG) Wag 6278 ...	18–17	7.9	8.0	8.1	8.5	11.0	12.1	3	1	Pale yellow
(MK) Mil 3/2 ...	20–16	9.9	10.4	11.2	12.5	12.3	12.6	7	1	White

*Half the number in each clone were tapped on 9 years renewed bark in 1954

1940 Clone Trial, Field 6, 9½ Acres, Nivitigalakele

Test-tapping of a number of selected foreign clones which gave promising yields in the early years was continued in 1954. The results are given in Table IV.

Clones AVROS 255 and 352 show outstanding yield increases in 1953/54 and are better than RRIM 501. Compared with clones PR107 and RLD 1 the AVROS clones show a susceptibility to Brown Bast and wind damage. There are indications that clone RRIM 501 also suffers from these defects. The standard of yield of clone RRIM 513 is not up to the standard of the high yielding clones, but its latex properties with regard to stability and colour are better than those of clone RRIM 501; Brown Bast and wind damage cases are negligible.

Clone Wag 6278 in its eighth year of tapping has given yields on a level with clone Tjir 1. The clones which appear in this final selection of foreign clones in the 1940 trial give considerable support to our recommendations for large scale planting in recent years. Most high yielding clones are susceptible to Brown Bast, and this disadvantage can be greatly minimised by adopting a reduced intensity in the first three years of tapping on high initial stands of trees per acre, recommended in recent years.

1941 Cearing, Field No. 8, 7 Acres, Nivitigalakele:

The test-tapping of the 1939 hand pollinated seedling families and selected clones established from these seedlings in this area was continued in 1954. The results for 1954 and past years are summarised in Tables VA and VB. The yields of seedling mother trees of the selected clones are given for 1954.

Clone RLD 8 continues to prove a reliable seed parent. This clone gave 6 lbs. d.r.c. per tree per year at 10 years of age in 1928, but was not selected for further testing against Clones Mil 3/2 and Wag 6278, which were yielding 17.7 lbs. and 17.1 lbs. d.r.c. per tree per year respectively in the same clearing. RLD 8 with its moderately good yields should be a very reliable constituent of a seed garden together with the two local clones Mil 3/2 and Wag 6278. It is also a good seed bearer; clone Pil A 44 has not been as successful when it is crossed with the local clones.

Most of the selected clones indicated in Table VB, which have been planted in 5 to 6 acre blocks in 1954 show increased yields in 1954. A selection of the remaining clones will be planted in 5 acre blocks in 1955. The selection of clones in the early years of tapping has been fully justified and the high yields from the clonal seedling families and the derived clones on this 1941 clearing at Nivitigalakele is confirmed by the commercial estate yield figures for Field No. 8 of 1,224 lbs. d.r.c. per acre for 1954.

1942 Clearing, Field No. 9, 5 Acres, Nivitigalakele:

Test-tapping of clonal seedling families from the 1940 hand pollinated seedlings was continued in this area. Clone Wag 6278 is tapped as a budded control. The yields for the first six tapping years are summarised in Table VI. The yields in general of clone RLD8 crossed with clones HC 28 and Tjir 1 are very promising. The latter crosses have done particularly well showing better yields than the control budded clone Wag 6278. Crosses with Clone Tjir 1, however, indicates a tendency to show up a fairly high incidence of Brown Bast.

TABLE IV

1940 Clone Trial, Field 6, 9½ Acres, Nivitigalakele

Tapped S/2, d/2, 100%

Trees First tapped in January 1947

Clone	No. of trees tapped 1954	Yield in lbs. d.r.c. per tree per tapping 140 tappings						Brown bast cases	Wind damage cases	Colour of Rubber in crepe
		1949	1950	1951	1952	1953	1954			
AVROS 255 ...	19–16	9.9	13.3	12.3	15.1	12.8	19.8	9	6	Pale yellow
AVROS 352 ...	18–15	7.7	9.2	9.5	11.3	12.0	18.0	8	5	—
RRIM 501 ...	16–20	11.7	10.8	13.0	13.9	14.7	15.6	7	5	Pale yellow
PR 107 ...	23–22	10.1	10.1	10.5	11.6	11.2	14.1	3	1	White
RLD 1 ...	23–22	8.0	9.8	10.5	12.3	11.1	13.9	2	–	White to Pale Yellow
PB 6/50 ...	21–22	8.9	11.1	9.5	9.3	9.8	13.8	6	2	Yellow
Lun N ...	21–19	8.2	9.7	8.9	10.5	11.7	13.4	5	1	—
War 4 ...	24–23	7.3	9.7	8.7	11.0	10.7	12.1	3	–	—
RRIM 513 ...	24–23	11.2	10.5	9.2	11.1	10.1	11.1	2	–	White
Controls										
Tjir 1 ...	22–21	8.1	10.8	10.8	7.7	13.6	13.0	7	1	Yellow
(WG) Wag 6278 ...	22	6.5	9.4	8.1	9.7	10.6	13.1	–	2	Pale Yellow

TABLE VA

1941 Clearing, Field 8 Tapping System S/2, d/2, 100%

Trees first tapped in 1947

Seedling Family	No. of trees tapped 1954	Yield in lbs. d.r.c. per tree per year on 140 tappings						Brown Bast cases	Wind Damage Cases
		1949	1950	1951	1952	1953	1954		
RLD 8×Mil 3/2 ...	47	8.2	9.4	11.5	12.2	14.2	16.5	9	1
RLD 8×Pil A 44 ...	36–37	6.5	7.7	8.3	9.0	10.1	11.6	5	–
Pil A 44×Wag 6278 ...	18	5.6	7.4	8.7	8.1	10.9	10.6	1	–
RLD 8×Wag 6278 ...	38–40	15.0	13.6	15.6	16.6	19.9	21.5	4	2
Pil A 44×RLD 8 ...	15	5.2	6.2	6.3	6.8	7.3	8.1	1	–
Control Wag 6278 (Budded) ...	40				9.0	11.3	14.1	1	1

TABLE VB

1941 Clearing N, Clone Trial, Field No 8 Tapping S/2, d/2, 100%

Clone	No. of trees tapped	Clone yields in lbs. d.r.c. per tree per year						Control clone yields 1954	Seedling Mother Tree and Family	Test-atex Class*	Mother Tree yields in lbs./tree/year 1954
		1949	1950	1951	1952	1953	1954				
RLD19**	4	11.5	11.3	11.5	13.8	15.9	20.1	15.0	40, RLD8×Mil 3/2	2	16.4
RLD9	4	12.5	13.7	13.8	15.7	13.0	19.6	11.1	28, RLD8×Mil 3/2	1	29.2
RLD51	5	11.4	10.4	13.9	14.6	17.2	19.2	8.9	39, RLD8×Mil 3/2	2	22.6
RLD22**	2–4	8.8	9.1	12.4	12.0	16.2	19.2	11.2	118, RLD8×Wag 6278	2	22.0
RLD16**	5–4	8.9	10.2	13.4	15.5	17.0	18.9	9.1	43, RLD8×Mil 3/2	3	30.1
RLD14	5	10.8	11.8	13.7	13.2	17.1	18.0	8.0	147, RLD8×Wag 6278	1	25.6
RLD13	4–3	13.5	14.5	13.3	14.2	12.8	17.8	14.1	16, RLD8×Mil 3/2	1	13.1
RR198	5–4	9.1	9.1	11.0	11.4	13.9	17.1	11.4	186, RLD8×Tjir 1	2	20.9
RLD17**	4	9.0	10.8	12.4	14.9	17.4	16.6	17.0	44, RLD8×Mil 3/2	3	16.2
RR169	5	8.5	8.9	11.6	12.5	15.0	16.6	22.6	120, RLD8×Wag 6278	2	—
RLD24**	5	9.5	9.5	12.1	11.9	14.5	16.5	7.1	34, RLD8×Mil 3/2	–	20.3
RLD12	5	9.6	11.4	11.5	14.3	15.1	16.5	11.8	31, RLD8×Mil 3/2	2	22.7
RLD11	5	9.2	12.1	10.4	14.6	12.7	16.2	15.8	110, Pil A44×Wag 6278	2	—
RR131	5	8.6	9.5	11.6	12.4	13.5	15.7	17.1	47, RLD8×Mil 3/2	1	21.2
RLD20**	5	11.6	9.7	11.6	13.5	14.1	15.5	13.4	41, RLD8×Mil 3/2	1	36.5
RLD23**	5	9.6	11.1	10.6	12.0	15.6	15.1	12.3	129, RLD8×Wag 6278	1	14.7
RLD27**	4	10.8	10.7	13.3	10.9	9.2	14.9	9.1	91, Pil A44×Wag 6278	1	3.8
RLD18**	5	8.5	9.7	10.6	13.2	12.6	14.6	12.6	38, RLD8×Mil 3/2	2	13.5
RLD21**	5–4	9.6	10.1	11.7	12.5	16.1	14.0	15.2	21, RLD8×Mil 3/2	2	13.7
RLD26**	5	9.3	10.0	10.3	10.8	10.7	13.9	12.8	77, RLD8×Pil A44	2	13.2
RLD10	5	11.2	15.8	11.6	14.8	14.9	13.4	10.1	50, Mil 3/2×Wag 6278	3	18.8
RLD25	5	10.8	10.3	11.3	10.8	13.9	12.9	15.8	36, RLD8×Mil 3/2	2	18.5

**Approximately 5 acres of each clone planted in 1954 at Hedigalla Station.

*No. 1 indicates the best yielding class.

1944 Small Scale Clone Trial, Field No. 11, Nivitigalakele:

Clones established from the 1940 H.P. seedlings in the 1942 clearing are planted as three tree clones. The yield results for 1954 and past years are summarised in Table VII. In assessing the high yields of clones in this area, the limited number of three trees in each clone must be taken into account, even so the figures give a strong indication of the potentialities of the selected RLD clones from a total of 90 clones originally planted out.

The high yielding qualities of a fair proportion of the three tree clones tested in this area are reflected in the commercial yield figures of 863 lbs. d.r.c. in the fourth tapping year, which is given in the report of the Estate Department for the 1944 clearing with 90 clones, many of which are mediocre, this is of course inevitable in large scale clonal tests in an experimental station.

It is interesting to note that almost all the selected clones have been established from clonal seedlings classified under class 1 according to the Testatex method or pricking tests, class 1, indicating the best yielders at seedling stage of the mother trees.

Several clones in this trial such as RLD 41 and RLD 28 are of outstanding promise.

Four of the best yielding selected RLD clones have been already planted in a large scale clone trial of monoclonal blocks of 5 to 6 acres. A further selection of clones will be planted out in a similar trial in 1955.

TABLE VI

1942 Clearing, Field No. 7 Tapped S/2, d/2, 100%

Trees first tapped in 1949

Seedling Family	No. of trees tapped 1954	Yield in lbs. d.r.c. per tree per year, 140 tappings						Brown Bast trees	Wind Damage trees
		1949	1950	1951	1952	1953	1954		
RLD 8×(HC) Hil 28 ...	68–69	3.0	4.8	6.9	7.1	8.5	10.2	6	1
RLD 8×Tjir 1 ...	62–65	4.0	6.8	9.4	10.0	13.2	14.0	14	4
AVROS 185 Illegit ...	20	3.0	4.6	7.5	8.4	10.6	11.9	1	1
(WG) Wag 6278 (Budded Control) ...	62–63	4.5	5.9	8.4	12.9	9.8	13.1	3	4
Boundary Trees ...									
RLD 8×Hil 28 ...	61–62			6.3	6.6	8.9	9.9	7	1
RLD 8×Tjir 1 ...	28–29			8.4	9.7	13.8	13.5	3	6
Wag 6278 (Budded) ...	54–55			7.9	11.7	9.4	12.8	4	4

TABLE VII

1944 Clearing, Nivitigalakele, Small Scale Clone Trial Tapped S/2, d/2, 100%

Trees first tapped in 1951

Clone	No. of trees tapped	Clone yields in lbs. d.r.c. per tree per year				Control Clone yield 1954	Seedling Mother Tree and Family	Testatex Class*	Mother tree yield in lbs. tree/year
		1951	1952	1953	1954				
RLD41 ...	2	7.3	12.6	16.2	33.2	14.3	14, RLD8×Tjir 1	1	29.4
RLD28** ...	2-3	9.7	14.9	15.2	32.0	18.0	115, RLD8×Hil 28	1	6.8
RLD39 ...	2	6.9	11.0	14.8	24.8	13.0	105, RLD8×Tjir 1	1	8.9
RLD42 ...	3	6.8	11.1	14.9	24.7	13.8	35, RLD8×Tjir 1	1	8.0
RLD45 ...	3	7.4	14.7	20.3	24.3	19.0	96, RLD8×Tjir 1	1	7.8
RLD31** ...	3	8.0	10.0	13.6	21.9	17.3	18, RLD8×Tjir 1	1	10.0
RLD30** ...	3	8.8	10.5	14.4	20.2	14.3	41, RLD8×Tjir 1	1	8.4
RLD29** ...	2-3	8.0	10.5	15.5	20.4	20.7	81, RLD8×Hil 1	1	9.7
5/5 ...	3	6.1	9.8	12.5	19.5	19.7	5, HC28×Wag 6278	4	—
2/101 ...	3	6.4	9.9	13.6	19.3	20.0	101, RLD8×Tjir 1	1	12.9
1/111 ...	3	5.9	9.2	13.4	19.1	15.4	111, RLD8×Hil 28	1	10.4
RLD44 ...	3	5.6	11.9	15.1	19.9	17.7	17, RLD8×Hil 28	1	8.4
1/37 ...	3	6.6	9.6	11.9	18.1	20.7	37, RLD8×Hil 28	2	15.5
1/48 ...	3	6.0	8.1	10.7	18.0	15.4	48, RLD8×Hil 28	1	22.1
2/40 ...	3	5.7	9.1	15.6	18.2	14.7	40, RLD8×Tjir 1	1	18.8
1/121 ...	3	6.3	7.9	10.4	17.4	14.7	121, RLD8×Hil 28	1	25.4
RLD43 ...	2	6.1	10.0	10.1	17.7	13.8	18, Ill. AV. 185	1	21.6
RLD59 ...	3	7.1	10.9	15.6	17.7	20.7	101, RLD8×Hil 28	1	10.9
RLD40 ...	3	6.4	11.9	15.1	17.9	6.0	3, RLD8×Hil28	1	17.9
1/44 ...	3	6.7	8.6	9.2	15.7	18.0	44, RLD8×Hil 28	1	7.5
2/33 ...	3	6.5	7.2	10.0	16.0	7.9	33, RLD8×Tjir 1	1	7.9
2/103 ...	3	5.8	9.3	10.2	15.9	19.0	103, RLD8×Tjir 1	1	—
2/28 ...	3	—	7.7	10.6	14.7	14.2	28, RLD8×Tjir 1	1	18.9

*No 1. indicates the best yielding class

**Planted in 1954 in monoclonal blocks of 5 to 6 acres.

1946 Replanted Area, 21 Acres, Large Scale Clone Trial, Field No. 12, Nivitigalakele:

A selection of foreign clones is planted in this area. 64 tree plots are replicated 8 times in a randomised block layout. Tapping commenced in March, 1953. The yield figures are summarised in Table VIII. The tapping system is on a 67 per cent. intensity for the first three tapping years. The trees were taken into tapping at 18 inches girth.

TABLE VIII

1946 Large clone trial, Nivitigalakele

Yield in lbs. d.r.c. per tree per year

	AVROS 255	AVROS 352	PB 6/9	PB 5/60	LCB 1320	CHM3	Tjir 1	PR 107
Yield 1953	3.91	3.25	6.25	5.74	3.91	3.75	3.89	3.39
Yield 1954	5.96	4.87	8.70	5.65	6.03	5.07	4.49	4.72
Girth in inches 1954	22.8	21.3	23.4	20.2	22.2	21.7	19.9	19.3
No. of Brown Bast cases	—	1	3	1	—	1	4	—
Wind Damage	2	7	1	1	1	15	6	—

The yields of all the clones are very satisfactory in this area. Clone PB 6/9 shows outstanding yields. A small area of this clone at Dartonfield planted in 1939 came in for sustained attacks of Oidium over a period of 3 to 4 months following each Oidium season. With effective Oidium control the clone should be very satisfactory. Clone AVROS 255 has given good yields with quite satisfactory secondary characteristics. Clone LCB 1320 is also very promising. The susceptibility to wind damage is confirmed in clones AV 352 and CHM 3; Clone PR107 has given satisfactory results for the second year of tapping. It has not grown so well as most of the other clones in this area. It has however good bark characteristics and is slightly resistant to Oidium and should show satisfactory increased yields, when the trees are tapped on 100 per cent. intensity.

'A' and 'B' budgrafts of clone Mil 3/2:

The 'A' and 'B' clones in this clearing represent budgrafts established from budwood taken from the highest and lowest yielding trees of the original budgrafts of clone Mil 3/2 at Nivitigalakele. Fifty trees each of the 'A' and 'B' series were planted as a subsidiary experiment in the 1946 replanted area. The trees were first tapped in 1953. The yield results for the year 1954 were as follows:—

	Yield in lbs. d.r.c. per tree per year
Clone Mill 3/2 'A' Series ...	4.6
,, ,, ,, 'B' Series ...	4.7

The yields in 1954 again confirm the fact that the conditions of environment and variability of stocks which give rise to differences in yield between the trees within a single clone, have no effect on the genetic constitution of the trees. Budwood taken from any tree within the clone will retain its own

genetic characteristics in a new environment. Budwood from a single clone can therefore be safely multiplied in nurseries from an authentic source of the clone growing in any environment.

Hedigalla Estate

1943 Clearing, Legitimate Seedling Trial, 4 5/8 Acres, Hedigalla:

The hand pollinated seed from crosses made in 1941 is planted in this area. The good foliage in recent years as a result of sulphur dusting together with systematic manuring shows substantial increases in yields for most of the seedling families. The limited number of crosses of clone PB86 with clones PR 107, Tjir 1, and RLD 8 give indications that this clone can produce some promising clonal seed when crossed with reliable clone parents. The yield figures are summarised in Table IX. The local clone RLD 8 which is only a moderate yielder shows up again as a reliable seed parent.

TABLE IX

1943 Clearing, Legitimate Seedling Trial, 4 5/8 Acres, Hedigalla
Tapped S/2. d/2, 100%, First tapped in September, 1950
Yield in lbs. d.r.c. per tree per year on 140 tappings

Seedling Family	No. of trees tapped	Yield		
		1952	1953	1954
RLD8×Diy 1(DBK)	58–61	7.8	8.4	11.9
RLD 8×Tjir 16	14	10.2	9.9	12.4
Diy 1×Mil 3/2	15	7.6	7.6	11.0
Tjir 1×PB 86 / PB86×Tjir 1	25	8.1	9.4	11.2
PB86×M 162	14	8.5	9.2	12.3
PB86×PR107	24	11.8	13.2	18.8
M3 (RR9)×RLD 8	11	6.2	6.0	9.7
RLD 8×PB86	4	11.8	13.5	17.6
Diy 1×Wag 6278	4	6.8	7.4	9.3
(HC) Hil 55×Tjir 1	3	9.2	6.9	6.2
(HC) Hil 55×Wag 6278	2	8.0	6.9	10.9
RLD 8×G. 771	3	14.3	14.0	17.9
DK 3513×RLD 8	2	14.2	13.5	17.1
TKD113×RLD8	13	—	—	13.7
Control (Budded) Wag 6278	86–91	7.1	6.7	12.8

1943/1944 Clearing, Trial of Five Tree Clones, 14 Acres, Hedigalla:

280 five tree clones established from the 1941 hand pollinated seedlings are planted in this area. The yields of the selected clones for further test-tapping and planting out on a large scale are given in Table X together with the yields of the seedling mother trees. The early selections for inclusion in the RLD series have been quite successful again. A number of these have been already planted out in 5 acre blocks in 1954. A few more clones will be selected for further trial from this area on the 1954 yield results. A total area of approximately 148 acres has been planted with selected high yielding clones of the RLD series in 1954 on Hedigalla Estate. These areas can be expected to make substantial contributions to the high average yields on this estate in the future. At the same time the best clones can be recommended for large scale commercial planting.

TABLE X

1943 Clearing, 5 Tree Clones and Mother Tree Seedlings
Tapped S/2, d/2, 100%, First tapped in Setpember, 1950
Yield in lbs. d.r.c. per tree per year on 140 tappings

Clone	Yield			Seedling Mother Tree Cross and No. of trees	Yield		
	1952	1953	1954		1952	1953	1954
RLD37*	18.6	15.2	21.7	RLD8×Diy 1 (DBK)	14.9	10.8	17.8
RLD36*	16.9	18.5	29.0	PB86×PR107	—	—	BB
RLD46	15.6	13.5	23.3	PB86×PR107	21.2	17.9	29.2
RLD33*	15.1	14.0	21.3	RLD8×Dal 5315 (DK)	9.9	—	—
RLD47	13.4	14.5	21.8	Diy 1×Mil 3/2 (MK)	13.5	17.3	13.5
RLD48	12.7	14.5	19.5	TKD113×RLD8	13.4	—	BB
RLD49	12.6	13.7	22.5BB	Mil1/3×Tjir 1	12.8	—	27.0
RLD32*	12.6	10.4	13.5	RLD8×H24	13.0	—	12.9
RLD50	12.2	12.6	18.6	Tjir 1×PB86	13.9	16.7	21.9
12/1	12.2	11.0	23.9	RLD8×Dal 5315	6.9	—	—
27/1	12.0	7.6	13.6	PB86×Tjir 1	7.0	8.0	9.3
28/1	12.1	7.9	17.2	M65×Pil B.84	14.5	—	17.1
30/24	12.0	10.1	18.6	PB86×PR107	10.4	16.2	36.2
9/1	11.6	12.3	23.0	RLD8×Tjir 16	15.4	17.5	12.7
14/2	11.5	9.7	17.6	RH10×Tjir 1	15.5	—	—
7/11	11.0	9.6	19.1	RLD8×Diy 1	10.8	12.5	14.2
RLD34*	11.4	8.8	11.9	RLD8×Tjir 16	9.3	8.2	8.0
RLD35*	11.1	11.7	18.0	PB86×Tjir 1	16.7	21.0	21.2
2/11	11.0	10.9	18.3	TKD113×RLD8	12.8	—	22 5
30/18	11.0	8.3	15.6	PB86×PR107	13.7	13.1	24.3
11/3	10.9	11.0	12.7	RLD8×PB86	—	—	—
30/2	10.6	11.8	15.0	PB86×PR107	10.5	11.5	11.4
7/42	10.6	8.8	11.6	RLD8×Diy 1	6.2	9.3	11.1
RLD38	9.4	10.6	20.3	PB86×PR107	12.0	17.2	17.8
31/9	—	13.2	16.4	PB86×M 162	—	—	15.6
Control							
Wag 6278			12.7				

*Planted in 5 acre blocks at Hedigalla in 1954.

1944 Small Scale Clone Trial, Hedigalla:

A selection of clones of the early R.R. series and two Prang Besar 'fraction' clones are planted in this clearing. The results are summarised in Table XI. Five clones are of no further interest. Clone RLD 52 has up to 1954 shown no indication of complete defoliation during the wintering period. The clone has shown an appreciable increase in yield in 1955, and is an extremely vigorous grower with heavy spreading foliage. Careful observation will be made for foliage conditions in 1955. Clone RLD 52 has been planted on the 'hedge' system in the 1949 clearing with 30 other clones. Spaced 6′ × 45′, 150 trees show an average girth of 20.2 at 5½ years of age. The average growth in this clearing is 16.5 inches.

TABLE XI

1944 Clearing Small Scale Clone Trial, Hedigalla
Tapped S/2,/d/2, 100%, Yield in lbs. d.r.c. per tree per year
Tapping started in May, 1951

Clone	Yield			Clone	Yield		
	1952	1953	1954		1952	1953	1954
RR20	4.6	4.9	7.3	RLD 52	7 2	8.3	13.1
RR23	5.5	5.8	7.5	RR29	6.4	7.7	12.4
RR24	6.5	7.8	13.0	AD24	4.7	3.8	5.0
RR25	7.5	9.5	13.9	PB5/122	7.1	7.6	14.9
RR27	5.2	3.6	4.4	PB6/5	10.3	9.1	13.1
				Wag 6278 (Control)	6.2	6.3	11.8

1944 Clearing, Stem Branch-Budding Experiment 1¼ Acres, Hedigalla:

This small scale experiment affords a study of bud-variation in the main stem and branches of seedling trees. H1 and H2 represent buds from the main stem from the lower and upper ends below the side branches. While 'B' represents branch buds from the first order branches. The three types of budgrafts from H1, H2 and 'B' are replicated fivefold, within each of 10 clone giving fifty comparisons. The yields of the 10 clones and the bud types are summarised in Table XIIA and XIIB. The yield of one of the clones 2/23, is quite promising in 1954.

TABLE XIIA

Yield in lbs. d.r.c. per tree per year, tapped S/2, d/2, 100%
Trees first tapped May, 1951

Clones	1/130	1/5A	2/72	1/3A	2/32	1/1A	2/23	2/63	1/4A	2/108
1952	4.9	5.6	5.8	2.8	6.6	4.8	8.4	6.7	2.6	7.3
1953	4.7	6.3	5.6	3.5	7.0	5.5	9.9	6.5	2.7	7.7
1954	7.0	8.9	9.3	4.6	10.0	7.8	16.9	11.4	3.6	10.1

TABLE XIIB

Bud Type		Yield in lbs. d.r.c. per tree per year		
		1952	1953	1954
H1	...	5.3	5.9	8.6
H2	...	5.7	6.3	9.1
B	...	6.0	5.6	9.5

Although the budgrafts established from the main stem buds showed seedling characteristics such as corky bark and conical form of the main stem, especially during the early years of growth, the yield results do not show any significant differences for the three types of budgrafts.

1945 Clearing, Crown Budding Experiment, 11¾ Acres, Hedigalla:

This experiment provides for a study of the effect of crown-budding on budded centre-sections. The results are given in Tables XIIIA and XIIIB which indicate the general layout of the experiment. 6 centre-sections of 6 clones of 6 trees each make up a plot of 36 trees. A single crown is superimposed on a 36 tree plot. The 6 centre-sections of each clone are crown budded at 5′ and 8′, making a 3 tree plot as the smallest sub-plot unit for the experiment.

The budded trees were crown-budded at 4 years of age due to war conditions. This should be done ideally at 18 to 24 months of age, when there is mature brown bark at the required height for crown-budding.

Girth measurements were taken in December, 1954.

TABLE XIIIA

1945, Crown Budding Experiment, Girth Measurements

Girth Increments in Inches 1953-54

Budded centre sections	Budded Crowns						
	Tjir 1	AVROS 256	PM17	PB86	Glen 1	Rub 393	Means
Tjir 1	2.72	2.51	3.19	3.22	3.29	3.06	3 00
Av. 256	3.29	2.91	3.24	3.66	3.21	3.53	3.31
PM17	3.02	3.09	3.26	3.49	3.26	3.77	3.32
PB86	2.94	3.11	2.89	3.36	3.21	3.38	3.15
Glen 1	2.94	3.37	2.96	3.28	3.03	2.64	3.20
Rub 393	3.01	3.62	3.26	3.48	3.49	3.83	3.45
Means	2.99	3.10	3.13	3.42	3.25	3.54	3.24

The rate of growth for all crowns has evened out somewhat in the 5th year after crown-budding.

TABLE XIIIB

Summary of Girth Increments in Inches from 1950 to 1954

Crown-budded in 1949-50

Crowns	Tjir 1	AVROS 256	PM17	PB86	Glen 1	Rub 393	Mean
Sep. 50-Dec. 51 ...	1.43	1.69	0.49	1.16	0.83	1.10	1.10
Dec. 51-Dec. 52 ...	3.08	3.22	1.75	2.84	2.27	2.29	2.59
Dec. 52-Dec. 53 ...	3.25	3.32	2.50	3.16	2.48	3.27	2.99
Dec. 53-Dec. 54 ...	2.99	3.10	3.13	3.42	3.25	3.54	3.24

Mean Girth Measurements, in inches 1954

Crowns	Tjir 1	AVROS 256	PM17	PB86	Glen 1	Rub 393	Mean
	20.7	21.9	17.8	21.2	18.5	20.0	20.0

1954 Girth Measurements for Height of Crown-Budding

	Mean girth in inches
Crown budding at 5 feet ...	20.0
„ „ „ 8 „ ...	20.1

There is no difference in growth when crown-budded at 5′ and 8′. Tapping was started on a small proportion of the trees in September, 1954. Tapping was restricted to a complete comparison of 2 sub-plots of 3 trees each comparing crown-budding at heights of 5 feet and 8. Under these conditions, which were introduced to balance tapping conditions between sub-plots, it was only possible to work on 30 comparisons from a total of 108 in the experiment. The results for the three months test tapping were as follows:—

Yield in grams/tree/tapping 1954

Crown budded at 5 feet ...	9.3
„ „ „ 8 „ ...	9.1

The above figures, however, give no indication of the effect of low and high yielding crowns on high yielding centre-sections, which is of practical importance. More conclusive evidence, will be available on these points when the whole area is test-tapped.

1945 Clearing, Large Scale Clone Trial, 10½ Acres, Hedigalla:

Six RLD clones No.'s 2 to 7 are tested against a control clone Tjir 1. The 6 clones were final selections from 120 three tree clones established from selected PBIG seedlings at Nivitigalakele Estate in 1935. Test-tapping was continued on 25 tree plots of each clone replicated in 3 blocks. The yield figures are summarised in Table XIV.

TABLE XIV

1945 Clearing, Clone Trial 10½ Acres, Hedigalla
Tapped S/2, d/3, 67%, First tapped in June, 1953
Yield in lbs. d.r.c. per tree per year, 94 tappings

Clones	RLD2	RLD3	RLD4	RLD5	RLD6	RLD7	Tjir 1
Yield 1954	6.3	4.8	7.4	8.2	6.5	6.8	5.0

Five of the six clones have given better yields than the control clone Tjir 1. On a 67% intensity the yields of clones RLD 4 and 5 are outstanding. The budwood of these clones is being distributed to estates for trial on a small scale.

1946 Clearing, Legitimate Seedling Trial of 1943 Hand Pollinated Seedlings:

The 1943 hand pollinated seedlings and five tree clones established from these seedlings are planted in this area in adjacent blocks. The seedlings were first tapped in April, 1953, and the budded trees in June of the same year, when the trees were 18 inches in girth. The tapping for the first three years will be on S/2, d/3, 67%. The results for 1953 and 1954 are summarised in Table XVA and XVB.

TABLE XVA

1946 Clearing, Legitimate Seedling Families, 1943 H.P. Tapped S/2, d/3, 67% Trees first tapped in April, 1953

Family	No. of trees tapped 1954	Yield in gms tree/tapping 1953	Yield in lbs. d.r.c. per tree per year 1954
PB86×Tjir 1 ...	13	15.4	4.8
PB86×Mil 3/2 ...	9	23.4	5.6
PB86×RLD8 ...	59–62	23.5	5.8
PB86×Wag 6278 ...	18	24.8	7.5
Tjir 1 (Budded) ...	58–67	14.4	4.9

Clone PB86 crossed with reliable seed parents again shows promising early yields in this clearing. The yields compare very favourably with the budded control clone Tjir 1.

TABLE XVB

1946 Clearing, 5 tree clones from 1943 H.P. Seedlings Tapped S/2, d/3, 67% Trees Test-tapped in June, 1953

Clone	Mother Tree Seedling Family	Yield gms/ tree tappng 1953	Yield lbs/tree/ year 1954
RLD55	PB86×Wag 6278	42.1	12.5
RLD54	PB86×Wag 6278	33.2	9.3
RLD57	PB86×RLD8	33.1	9.1
RR224	PB86×RLD8	29.1	9.6
RR220	PB86×RLD8	26.4	8.0
RR279	PB86×Wag 6278	25.6	7.9
RR260	PB86×RLD8	30.0	7.6
RR240	PB86×RLD8	29.7	7.6
RR258	PB86×RLD8	29.5	7.7
RR299	PB86×Mil 3/2	26.7	7.8
RR237	PB86×RLD8	24.1	6.5
RR278	PB86×Wag 6278	25.6	6.9
RR301	PB86×Mil 3/2	25.6	6.7
RR229	PB86×RLD8	21.1	6.5
RR208	PB86×RLD8	23.9	6.8
RR232	PB86×RLD8	21.0	6.5
RR304	PB86×Mil 3/2	21.5	6.9
RR263	PB86×RLD8	21.8	6.4
RR268	PB86×Wag 6278	22.9	6.6
RLD53	PB86×RLD8	43.1	6.3
RR241	PB86×RLD8	30.4	6.3
RLD56	PB86×Wag 6278	32.1	5.5
RR261	PB86×RLD8	24.4	5.6
RR257	PB86×RLD8	26.0	5.8
RR252	PB86×RLD8	27.9	6.1
RR206	PB86×RLD8	21.9	5.7
RR218	PB86×RLD8	23.2	6.0
RR231	PB86×RLD8	21.8	5.8
RR274	PB86×Wag 6278	21.4	5.7
RR296	PB86×Mil 3/2	23.7	5.7
RR272	PB86×Wag 6278	21.8	6.2
RR200	PB86×RLD8		5.6
RR233	PB86×RLD8		5.8
RR250	PB86×RLD8		5.3
RR246	PB86×RLD8		5.7
RR264	PB86×Wag 6278		6.0
RR286	PB86×Tjir 1		6.0
RR204	PB86×RLD8		5.2
RR255	PB86×RLD8		5.3
Control Tjir 1			4.9

Most of the selected five tree clones in Table XVB have given promising yields within the first 18 months of tapping on a 67% intensity. Three of the four clones included in RLD series in the first 5 months tapping have given the better yields in 1954. These RLD clones were planted out in nurseries at Nivitigalakele for the propagation of budwood for use in further large scale trials.

1946 Clearing, Legitimate Seedling Trial, 1944 Hand Pollinated seed:

The 1944 seedlings were planted in August, 1947 in an area from the 1946 clearing, which was left over from 1946. The five tree clones established from the 1944 seedlings were planted in the 1947 Clearing. The seedlings were tapped from 1953 and the 244 budded five tree clones were tapped from June, 1954. The results are summarised in Tables XVIA and XVIB. Clone PB 5/139 has crossed well with TKD 113. The latter which is a Tjikadoe seedling tree from the 1935 clearing at Nivitigalakele has crossed well with a number of clones. A clone RR29 established from this seedling tree is planted in the 1949 'Hedge' planting trial at Hedigalla, and will be tapped in 1955. There is further evidence that crossed seed of clone PB86 can give satisfactory yields. The average yield of selected PB86 clonal seedlings in 1954, representing crosses with a fair range of clonal parents, is quite promising. There are indications that clone PB86 makes poor crosses with clones Glen 1 and BR2.

The yields of a selection of five tree clones in the 1947 clearing are given for the first 7 months of tapping. Yields of over 20 grams per tree per tapping are outstanding.

TABLE XVIA

1946 Clearing, Legitimate Seedling Families, 1944 Hand Pollinations. Tapped S/2, d/3, 67%. Yield in lbs. d.r.c. per tree per year 94 tappings

Trees first tapped in 1953

Family	No. of trees tapped	Yield	
		1953	1954
PB5/139×TKD113	129–136	5.2	8.1
PB86×TKD113	38–39	4.8	6.9
PB86×Glen 1	16	2.7	4.2
PB86×BR2	20	2.0	3.2
PB86×(MK) Mil 3/2	10	4.7	8.3
PB86×(DK) Dal 5315	8	2.2	3.1
PB86×BD10	8	3.2	5.4
PB86×Pil B 84	6	3.0	5.4
PB86×PB5/60	7	2.8	5.0
PB86×Wag 6278	5	3.3	5.9
PB86×PB5/139	5	2.8	5.7
PB86×(HC) Hil 28	5	3.7	5.5
PB86×AVROS163	4	3.5	6.2
PB86×PB6/50	4	3.7	4.3
PB86×Tjir 1	3	2.0	4.5
TKD113×Tjir 1	18–23	4.1	7.4
TKD113×RLD5	12–14	5.4	8.3
TKD113×Glen 1	10	3.5	7.1
TKD113×Hil 28	1	3.5	7.3

TABLE XVIB

1947 Clearing, Five Tree Clones Established from 1944 H.P. Seedlings, Hedigalla
Tapped S/2, d/3, 67%, First Tapped in June, 1954
Yield in grams/tree/tapping

Clone No.	Yield 1954 (7 months)	Clone No.	Yield 1954 (7 months	Clone No.	Yield 1954 (7 months)
2	19.1	128	16.2	192	17.6
16	25.2	129	25.1	201	16.9
17	15.0	130	23.8	202	15.1
18	17.6	134	15.8	205	20.1
28	18.3	135	18.2	206	16.3
33	15.2	136	19.8	211	18.2
39	30.7	159	20.1	256	21.4
51	24.6	161	17.2	260	16.5
56	17.2	172	19.0	263	18.4
82	30.3	173	21.2	281	15.7
85	16.4	174	16.2	293	22.4
89	17.2	178	15.0	359	20.3
109	24.1	186	16.8		
		188	19.5		

1947 Clearing, Legitimate Seedling Trial, 1945 Hand Pollinated Seedlings:

This area was planted with 3,500 stumped hand pollinated seedlings in October, 1947. About a third of the seedlings were lost following a severe drought soon after planting. The vacancies were supplied with seedlings of clone TJ. 1 (selfed) and PB86 (illeg.). Tapping commenced in April, 1954. A summary of the preliminary yields is given in Table XVIC.

TABLE XVIC

1947 Clearing, Legitimate Seedling Trial, Hedigalla
Yield in grams per tree per tapping, tapped S/2, d/3, 67%
from April to December, 1954

Family Cross	No. of trees tapped	Yield
AV163×RRIM506	117–120	9.3
AV163×RRIM514	16	9.0
BR2×RRIM506	58	10.6
PB5/139×RRIM501	40	17.3
PB5/139×RRIM504	51	15.6
PB5/139×RRIM506	31	15.6
PB5/139×RRIM511	36–37	14.9
PB5/139×RRIM513	29–31	15.4
PB5/139×RRIM518	22	13.4
PB5/139×RRIM519	33	16.7
PB5/139×RRIM520	34–36	13.7
PB5/139×KD2	8	14.8
PB5/139×PB6/50	2	13.0
RRIM514×PB5/139	12	11.7
PB86×AV163	1	23.4
PB86×RRIM519	11	17.4
PB86×RLD4	32	14.6
PB86×RLD5	109–110	12.8
PB86×RLD7	207–209	16.4
PB86×AV255	52	11.5
PB86×AV352	5	5.8
PB86×AV157	34	8.4
PB86×PB23	4	14.7
PB86×RLD2	1	10.7
Tjir 1×RRIM514	57–58	7.9
Tjir 1×AV255	46–47	11.4
PB86 (Illeg.)	355–359	8.6

The large number of seedlings in families of clone PB86 in this clearing will give most useful indications of the potentialities of clone PB86 as a seed parent. There are early indications of promising yields in some of the crosses. The tapping cuts have been opened at a height of 35 inches from ground level where the yield is considerably reduced on seedling trees.

1949 Clearing, Large Scale Clone Trial, Hedge Planting 6′×45′, 34½ Acres, Hedigalla:

In this area 31 clones are planted in 25 tree plots replicated sixfold in an incomplete block layout. The planting was completed in July, 1949. Girth measurements were taken in December, 1954. The figures are summarised in Table XVII together with the girth increment figures for 1953/54 for 12 months growth.

TABLE XVII

1949 Clearing, Large Scale Clone Trial, Hedge Planting
Hedigalla Mean Girth in Inches

Clone	Girth Dec. 1954	Increase 1953/54	Clone	Girth Dec. 1954	Increase 1953/54
RR19	14.4	2.8	RR46	17.5	4.4
RLD52	20.2	4.9	RR48	16.7	4.2
RR29	17.1	4.3	RR49	17.2	4.0
RR30	17.6	4.2	RR50	14.0	2.8
RR31	17.4	4.0	RR51	15.7	3.4
RR32	13.7	3.3	Nab 16	14.7	3.8
RR33	19.2	4.8	Nab 17	17.8	4.7
RR34	14.7	3.8	Nab 20	18.0	4.8
RR35	17.0	4.0	DAR 38	16.3	3.7
RR37	16.4	3.8	DAR 40	17.2	4.0
RR40	16.4	4.0	RRIM501	16.1	3.8
RR41	14.8	3.8	RRIM504	16.9	4.1
RR42	17.4	4.1	RRIM513	16.1	3.8
RR44	15.7	3.7	PB86	17.1	4.3
RR45	15.3	3.2	PB6/50	19.0	4.3
			Lun N	14.8	3.5
			Mean	16.5	3.9

Considering the fact that 31 clones of varied growth characteristics are planted in this area the average girth of 16.5 inches is very satisfactory for $5\frac{1}{2}$ years of age. Clone RLD52 which is under observation in the 1944 clone trial for its extremely vigorous growth and its partial wintering habits in the 10th year of growth, shows an average girth in this clearing of 20.2 inches at $5\frac{1}{2}$ years of age. The better known clones PB86, RRIM501 and 513, PB6/50, Nab 17 and 20 also show satisfactory growth in this 'hedge' planting experiment. Clone Lun N is somewhat backward. 21 clones out of 31 show an average girth of 16 inches and over at $5\frac{1}{2}$ years of age on very hilly land at Hedigalla. For experimental tapping at 18 inches girth a number of clones should be in tapping in 1955. The form of contour 'hedge' planting has a number of advantages with regard to the following:—

1. Allocation of large tapping tasks on steep land.

2. Ease and rapidity of tapping and collections during an imminent wash-out by rain.

3. Quicker drying out of tapping panels and better control of bark diseases.

4. Selective thinning out of high stands of rubber.

5. Better adapted for dusting operations.

We have generally recommended only 'avenue' systems of planting on a commercial scale, the budded rubber being planted $8' \times 30'$. A few estates are trying out the 'hedge' planting systems with subsidiary crops such as Cocoa and Coffee. For rubber alone, there are indications that about 7 feet will be the minimum distance in the rows for budded trees and about 5 feet in the rows for high initial stands of clonal seedlings which will be thinned out later.

The bark measurements of the following clones at 4 points at 3 feet height made in January, 1955, show even development of bark all round the stem.

Clone	Average bark thickness in mms. Main stem facing rows	Main stem facing avenues
RLD52 ...	5.6	5.5
Nab 17 ...	5.1	5.0
Nab 20 ...	6.0	6.0
RRIM501 ...	5.1	5.1
RRIM513 ...	4.8	4.8
PB86 ...	5.5	5.4
Lun N ...	5.2	5.1

Hedge planting systems have been successfully adopted in Indonesia for many years with secondary crops, such as coffee, and we await the yield results from our 1949 clearing with considerable interest.

In Ceylon where flat rubber land is the exception, and the rainfall is heavy and badly distributed for tapping the question of the size of tapping tasks, the drying out of tapping panels, and the incidence of bark diseases due to humid conditions are important factors in the economics of rubber production.

1950 Clearing, Clone Trials, 20 Acres, Hedigalla:

There are three small scale clone trials in this area. The clones are planted in 25 tree plots replicated three to fourfold. Girth measurements were taken in December, 1954 and the results are summarised in Tables XVIIIA, XVIIIB, XVIIIC.

TABLE XVIIIA

Experiment 1, Planted May, 1951

Mean Girth in Inches

(Chaemara)

Clones	CH 2	CH 3	CH 4	CH 8	CH 26	CH 29	CH 31	CH 32	PB 86	LCB 870	Mean
Girth	13.6	14.6	12.5	12.1	15.2	12.6	11.8	14.5	14.1	13.2	13.4
Increase 1953/54	4.7	5.2	4.8	4.6	5.6	3.9	4.2	5.0	5.1	5.1	4.8

The average girth increment in this experiment is well above the normal standard of girth increase for Ceylon plantations and the average growth of 13.4 inches for $3\frac{1}{2}$ years of age is most satisfactory.

TABLE XVIIIB

Experiment II

Planted, May 1951, Mean Girth in Inches

Clone	Seedling Mother Tree	Girth 1954	Increase 1953/54
DAR34	Ill. Seedling of Mil 1/1 (DAR)	10.5	3.8
RLD13	RLD8 × Mil 3/2	10.7	4.8
RLD15	Wag 6278 × Mil 3/2	12.1	4.4
141/41N	RLD8 × Wag 6278 (194IN)	11.2	4.7
154/41N	RLD8 × Wag 6278 (1941N)	9.8	4.6
RLD10	Mil 3/2 × Wag 6278	14.7	6.1
RLD9	RLD8 × Mil 3/2	10.8	4.6
PB9/82		9.9	4.0
LCB 870		11.9	5.2
PB86		12.0	5.6
Mean		11.3	4.7

TABLE XVIIIC

Experiment No. III

Planted in July 1951, Mean Girth in Inches

Clone	Seedling Mother Trees	Girth 1954	Increase 1953/54
RLD11	Pil A 44 × Wag 6278	9.6	4.1
RLD12	RLD8 × Mil 3/2	10.0	4.2
RLD14	RLD8 × Wag 6278	10.6	4.2
RR38	TKD Seedling No. 73, 1935N	8.5	3.5
RR39	„ „ 86, „	11.1	4.6
RR43	„ „ 109, „	7.0	2.8
RR52	PBIG „ „ 143, „	11.3	4.6
RR53	„ „ 184,	11.6	4.6
RR54	„ „ 197,	10.1	3.8
DAR33	Ill. Seedling Mil 1/1 (DAR)	9.9	3.8
OY 1		7.0	2.5
PB86		10.3	4.2
LCB870		10.1	4.3
Mean		9.9	3.9

The growth increase of trees in experiments II and III has been very satisfactory in 1953/54 and the general growth for trees of 3½ years is satisfactory.

1952 Clearing, 25 Acres, Hedigalla:

This area is planted with 645 five tree clones established from the 1945 hand pollinated seedlings planted in the 1947 clearing at Hedigalla. The planting was carried out in October-November, 1952. The growth of trees for just over two years of age is outstanding at 7.6 inches average girth in December, 1954.

The following areas at Hedigalla which have been planted in 1953 and 1954 have been maintained in a very satisfactory condition under general estate management. Several inspections of these areas have been made by the technical staff.

1. Large scale clone trial 96½ Acres, Hedigalla. Five to six acres each of clones RLD 1 to 7, Clones RRIM501, 513, LCB1320, 870, Wag 6278, Mil 3/2 and Lun N are planted in this area.

2. 1953 Clearing Seed Garden 14½ Acres, Hedigalla.

3. 1954 Clearing, Large Scale Clone Trial, 148 Acres, Hedigalla.

These trials provide for a final test of selected RLD clones and imported clones on a commercial basis before recommendations are made for large scale planting on estates. Budwood of all the clones are being distributed to estates for trial on a small scale 5 to 5¼ acres each of clones RLD16 to 37 were planted in single blocks of 800 to 840 trees to provide four tapping tasks. Clones RRIM 501 and IRCI 10 were included as controls.

Apart from the test-tapping of these tasks under the supervision of the field staff of the Botanical Department once or twice per month the total yearly yields on a commercial basis will be available from the records of Hedigalla Estate. The method of recording the yield per task by weight and the d.r.c.

by a sample coagulation of 50 c.c. from the yield per task on commercial tapping days will give us a standard of accuracy of yield figures far above that possible on estates using a metrolac for the d.r.c. figures.

Budwood Nurseries, Nivitigalakele Estate:

Budwood of the new RLD clones No.'s 16 to 37 established in the nurseries were used in 1954 for planting 148 acres of Hedigalla Estate. Budwood will be made available to the planting industry in 1955 for small scale trials.

Importation of Foreign Clones:

During the year 1954 eighty foreign clones were imported into Ceylon from foreign rubber growing countries. 20 New RLD clones were sent to each of four experimental stations on an exchange basis agreed to at a conference held at Bogor Indonesia early in 1954. The decision was finalised in a Far East Directors Liaison Committee Meeting held during the Bogor Conference.

A considerable amount of correspondence in connection with the negotiations for the exchange of planting material devolved on the writer. The necessary papers for the export and import of these exchange clones were obtained from various government departments. Personal attention was given by the Botanist to the clearing of the planting material from Colombo, and initiating the budgrafting in the nurseries. The clones were finally established in the budwood nurseries on Nivitigalakele estate.

5 metres of budwood of each of the following clones were imported in exchange for 20 RLD clones as shown below:—

TABLE XIX

From R.R.I. Malaya	From I.R.C.I. Laikhe Indochina	From AVROS Medan Indonesia	From C.P.V. Bogor Indonesia	Exchange clone Exported from Ceylon
RRIM526	TR1406	AVROS 308	WR 101	RLD 1
,, 527	,, 1486	,, 385	GT 1	,, 2
,, 601	,, 1512	,, 427	PR 226	,, 3
,, 602	,, 1514	,, 529	,, 228	,, 4
,, 603	,, 1542	,, 1060	,, 231	,, 5
,, 604	,, 1548	,, 1191	,, 247	,, 6
,, 605	,, 1555	,, 1328	,, 248	,, 7
,, 607	,, 1573	,, 1349	,, 249	,, 14
,, 608	,, 1560	,, 1350	,, 250	,, 16
,, 609	,, 3633	,, 1447	,, 251	,, 17
,, 610	,, 3645	,, 1502	,, 252	,, 21
,, 611	,, 3702	,, 1518	,, 253	,, 22
,, 612	,, 3705	,, 1591	,, 254	,, 28
,, 615	IRCI 1	,, 1712	,, 255	,, 36
,, 617	,, 2	,, 1734	,, 256	,, 37
,, 618	,, 3	,, 1735	,, 257	,, 41
,, 620	,, 5	,, 1851	,, 258	,, 42
,, 621	,, 6	,, 1907	,, 259	,, 45
,, 622	,, 8	,, 2012	,, 260	,, 51
,, 623	,, 9	,, 2037	,, 261	,, 59
				Nab 12*
				,, 15*
				,, 17*
				,, 20*

*Alternative clones making a total of 20 clones

RRIM. 1951 Collection:

140 of the clones representing clones established from seedling material of Hevea species brasiliensis, spruceana and benthamiana arrived in Ceylon in June, 1954, with the exception of a few clones; this planting material originally imported by the R.R.I.M. Brazil and Peru was successfully established at Dartonfield.

Tapping of H.P. Seedling families and derived clones on outside estates:

This work was supervised by the Plant Breeder which extended over 10 field trials on 9 estates. All trees of the seedling families were test/tapped once a month and a selection of five tree clones after a preliminary estate commercial tapping was carried out under the personal supervision of our trained field staff. A considerable amount of organisation was required for making the necessary arrangements with the estate for labour requirements, and payment of rubber removed to Dartonfield as test-tapping biscuits. The results are summarised in Tables XIXA and XIXB.

We find again that the better known clone parents crossed with clone PB 86 have given some promising clonal seedling families, indicated by early yields in the first year of test-tapping. The yields of five tree clones in the selected short list given in XIXB are outstanding and the best of these will be established in the R.R.I. nurseries at Nivitigalakele for budwood multiplication. It will be noted that these initial yields are of a higher order than those at the experimental station of the R.R.I. at Nivitigalakele and Hedigalla, due to the fact that commercial estate tapping is on trees of 22 inches girth and in many cases tapping had already been done for about a year, before the trees were test-tapped.

Hand Pollination Programme 1954:

A small scale pollination programme was carried out in 1954. The weather was very unfavourable for pod-set and the results were not very satisfactory. Attempts to cross between closely related families to segregate desirable character also contributed to the reduction of the numbers of 'sets'. A summary of the crosses made in the 1954 programme is given in Tables XXA and XXB.

TABLE XIXA

Yield in grams per tree per tapping for the first year of tapping of 1945

Hand Pollinated Seedlings planted on outside Estates in 1947

Estate No.	Family Cross	Yield gmm	Estate No.	Family Cross	Yield gmm	Estate No.	Family Cross	Yield gmm
1	PB5/139×RRIM 513	24.4	8	PB139×KD1	33.6	2	PB86×AVROS 255	23.3
2	,, ,,	20.8	5	,, ×BD10	19.1	7	,, ,,	30.4
3	,, ,,	35.9	7	,, ,,	31.1	8	,, ,,	32.4
1	,, ×RRIM 518	24.2	8	,, ,,	36.8	9	,, ,,	24.8
2	,, ×RRIM 501	35.2	8	,, ×PB6/50	43.1	2	,, ×AVROS 352	21.1
2	,, ×RRIM 504	50.1	9	,, ×BR2	28.2	8	,, ,,	20.8
2	,, ×RRIM 520	36.4	8	,, ×RRIM514	39.9	2	,, ×AVROS 157	36.7
5	,, ,,	21.2	8	RRIM514×PB5/139	44.6	8	,, ,,	23.2
7	,, ,,	41.8	2	PB5/139×RRIM506	37.6	2	,, ×AVROS 163	19.3
9	,, ,,	28.8	3	RRIM506×PB5/139	25.7	2	,, ×RRIM 519	29.8
2	,, ×TJ 1	31.3	1	PB86 ×RLD 7	34.9	7	,, ,,	38.6
5	,, ,,	22.8	7	,, ,,	49.6	2	,, ×RLD 4	23.3
3	,, ×RRIM 511	30.6	8	,, ,,	39.7	2	,, ×RLD 5	22.2
5	,, ×RRIM 519	22.2	9	,, ,,	32.9	7	,, ,,	37.1
5	,, ×KD1	25.7	2	,, ×PB23	28.0	9	,, ,,	25.3

TABLE XIXB

Yield in grams per tree per tapping for the first year of tapping of Clones derived from 1945 Hand Pollinated Seedlings planted in 1947 on outside Estates.—method of planting: 5 points to a clone

Estate No.	RLD No.	Yield gmm.	Estate No.	RLD No.	Yield gmm.	Estate No.	RLD No.	Yield gmm.
1	241	74.2	7	274	50.2	2	215	42.5
9	304	65.7	3	305	50.0	3	206	42.5
9	306	64.1	8	247	47.9	7	277	42.2
1	238	62.5	9	293	47.9	1	239	41.7
3	202	60.0	7	278	46.3	7	275	41.6
9	299	58.6	8	241	46.0	5	287	41.4
3	208	57.2	7	271	45.8	1	235	40.7
2	212	56.6	1	240	45.6	9	301	40.7
9	295	56.1	9	305	44.8	9	302	40.4
9	294	55.4	9	312	44.3	9	296	40.4
9	292	54.0	7	273	44.3	7	272	40.2
7	280	52.3	2	221	44.2	5	290	40.0
5	288	52.1	8	246	43.3	2	224	40.0
5	285	51.1	2	219	43.1			

TABLE XXA

1954 Hand Pollinations

Dartonfield

Cross	No. of Pollinations	No. of sets	% set	No. of seeds obtained	Seeds germinated	% Germination
AV157 × CHM2 ...	21	nil	—	—	—	—
AV157 × RR28 ...	102	nil	—	—	—	—
„ × RLD36 ...	9	nil	—	—	—	—
„ × RRIM504 ...	4	nil	—	—	—	—
„ × RRIM501 ...	308	37	12.0	60	51	85
„ × BR2 × AV255 ...	545	1	0.2	—	—	—
„ × RLD8 ...	192	5	2.6	—	—	—
RRIM501 × BR2 × AV255 ...	227	12	5.3	14	7	50
RLD8 × PB6/5 ...	161	17	10.6	48	47	97.9
MK3/2 × RLD8 ...	300	5	1.7	—	—	—
„ × PR107 ...	161	6	3.7	9	nil	—
„ × RRIM501 ...	300	2	0.7	3	3	100
„ × PB6/5 ...	194	3	1.5	3	3	100
TOTAL ...	2524	88		137	111	

Hedigalla

RR28×LC8B70	...	290	nil	—	—	—	—
,, ×TJ 1	...	22	nil	—	—	—	—
,, ×PB6/5	...	161	4	2.5	6	2	33.3
RRIM504×RLD37	...	86	7	8.1	20	17	85
RLD50×RLD36	...	314	nil	—	—	—	—
RLD50×11/3	...	307	nil	—	—	—	—
RLD50×RLD37	...	305	nil	—	—	—	—
RLD50×RLD37	...	305	nil	—	—	—	—
RLD37×RLD36	...	253	1	0.4	3	3	100
RLD37×RLD36	...	18	nil	—	—	—	—
RLD36×PB6/5	...	24	nil	—	—	—	—
RLD36×RLD37	...	310	9	2.9	18	17	94.4
RLD36×11/3	...	304	8	2.6	8	8	100
RLD36×RLD50	...	307	4	1.3	3	2	66.6
RLD36×RLD8	...	320	9	2.8	9	9	100
RLD38×RLD50	...	303	nil	—	—	—	—
RLD38×RLD37	...	361	nil	—	—	—	—
RLD38×PB6/5	...	79	nil	—	—	—	—
RLD38×11/3	...	305	6	2.0	9	nil	0.0
TOTAL	...	4,069	48		76	58	

Summary of Pollinations—1954

Dartonfield	...	2,524	...	...
Hedigalla	...	4,069	...	... 6,593 (Total no. of pollinations)
Total no. of sets	...		...	136
Average percentage fruit set	...		...	2.06%
Total no. of seeds obtained	...		...	213
,, ,, germinated	...		...	169

Average percentage of seed germination 79.34%

Nurseries—Dartonfield

Total number of seedlings originally planted in the Dartonfield nurseries	...	169
Number of seedlings dead by 8-11-54	...	7
Total number surviving in the nurseries	..	162

TABLE XXB

FURTHER DETAILS ON 1954 HAND POLLINATIONS

Relation between closely related families

Original parents	Cross	Relationship	No. pollinated	No. of fruits set
TJ 1×PB 86 PB 86×PR 107	RLD 50×RLD 36	1/2 sib.	314	Nil.
TJ 1×PB 86 RLD 8×PB 86	RLD 50×11/3	1/2 sib.	307	Nil.
PB 86×PR 107 RLD 8×PB 86	RLD 36×11/3	1/2 sib.	304	8
PB 86×PR 107 TJ 1×PB 86	RLD 36×RLD 50	1/2 sib.	307	4
PB 86×PR 107 TJ 1×PB 86	RLD 38×RLD 50	1/2 sib.	303	Nil.
PB 86×PR 107 RLD 8×PB 86	RLD 38×11/3	1/2 sib.	305	6
TOTAL			1840	18

No pollinations have been carried out for resistance against Oidium.

REPORT OF THE MYCOLOGICAL DEPARTMENT FOR THE YEAR 1954

By

C. A. de Silva

Acting Mycologist

SUMMARY

Oidium heveae:

A talk was given by the Mycologist in May, 1954 at the Kalutara Planters' Association on the incidence and control of Oidium heveae in Ceylon. Notes summarising the available information was sent out to all rubber interests entitled to receive R.R.I. publications. A copy of these notes is appended to this report.

Oidium leaf disease was quite severe in areas which were not sulphur dusted in 1954. Following on the good results obtained in dusted areas in 1953 very effective control was obtained again in 1954. This resulted in full healthy foliage on most clones. A few areas on the higher elevations with inadequate dusting suffered severe attacks of the leaf disease.

Indirect Control:

The best way of controlling Oidium is by the evolution of resistant clones. An effort to combine resistance to Oidium with other desirable characteristics, especially yield, must necessarily be a long term research policy in plant breeding.

A considerable amount of preliminary work has been done in crossing the resistant clone, LCB. 870 with the better known high yielding clones in hand pollination programmes carried out since 1951. The seedling families obtained have been planted out at a high stand per acre, which will be thinned out leaving the highest yielding seedlings for observations on resistance to Oidium.

Crown Budding:

Several experiments have been laid down since 1948, on crown-budding both seedlings and budded rubber with the resistant clone LCB. 870. In this connection it is important to have conclusive results of the effect of a low yielding clone LCB. 870 used as a crown on high yielding centre budded sections. It has been tentatively recommended that crown-budding at a height of 8 feet will have little effect on the tapping panel of the budded centre sections based on preliminary experiments carried out in Indonesia, but further experimental yield data are awaited to confirm the effects of crown-budding at heights of 5′ and 8′. No differences in growth have been found from crown-budding at these two heights in a large scale crown-budding experiment on Hedigalla Estate. Crown-budding at about 6 feet would reduce the costs of carrying out this operation over large areas.

It should be noted that clone LCB. 870, which is resistant to Oidium at normal rubber growth elevations may be attacked above 2,000 feet. The R.R.I. has successfully negotiated for the importation of a number of South American clones resistant to Dothidella ulei. These clones will be tested against Oidium. If a clone is found resistant to both Dothidella and Oidium it will be most useful for crown-budding and will obviously replace clone

LCB. 870. At the time of writing this report in January, 1955 seventeen Dothidella resistant clones have already arrived in Ceylon from the R.R.I. of Malaya who originally imported this material. This collection contains Clone FX.25 one of the better known clones which has been found to be resistant to Dothidella ulei.

DIRECT CONTROL

Sulphur—Dusting:

This has been adequately dealt with in the appended notes, on Oidium Control in 1954. Five rounds of twelve pounds of standard sulphur per acre at weekly intervals gave satisfactory control under average conditions.

A number of dusting rounds is required for controlling the leaf disease at higher elevations. In such cases field trials showed that 2 rounds per acre per week at the normal 12 lbs. per acre of sulphur dust each round is successful. Attention has been already drawn to the fact that contour 'Avenue' and 'Hedge' planting systems may be better adapted to sulphur dusting and spraying operations.

Sulphur:

The standard of sulphur dust for satisfactory results have been laid down with regard to the required properties and embodied in the relevant Government Regulations.

Several attempts have been made by manufacturers to improve the efficiency of dusting by the use of stickers, so far no improvements of practical importance have been observed.

Spraying:

Spraying with liquid lime sulphur from the ground gives good control but the method is impracticable under most conditions due to its high cost. Two rounds of dry dusting are equally as effective as one round of spraying and much cheaper.

Aerial Spraying:

An Aerial spraying trial was carried out in Ceylon for the first time in 1954. The spraying was carried out by Messrs. Pest Control Ltd., supervised by the R.R.I. The trial was sponsored by the Ceylon Government and the Planters' Association of Ceylon. The results obtained on Oidium control were unsatisfactory compared with those obtained from spraying and dusting from the ground. Areas on 13 estates were sprayed during the 1954 season. A full report of the 1954 aerial spraying will be published in a quarterly circular publication in 1955.

Dusting Machinery:

A full description of dusting and spraying machinery has been given in the Annual Report for 1953. Further improvements have been effected in 1954 on most machines. From a point of view of engine efficiency in the field the 4 stroke engines are to be preferred.

Diseases other than Oidium:

Enquiries on diseases and pests with and without submitting specimens have been surprisingly small. The total number for 1954 was 36. It is evident, therefore, that apart from (Fomes) Leptoporus lignosus root disease, bark diseases, Oidium heveae, and indications of 'secondary' leaf fall due to Phythophthora, most other pests and diseases in general are not of any serious economic importance at the present time.

Root Diseases:

In the case of white root disease, Leptoporus lignosus, as far back as 1948, the attention of the planting industry was drawn to the fact that old seedling rubber can carry the fungus in the root system, with no indications of the disease above ground. This has been confirmed in many areas of old seedling rubber in Ceylon which have been poisoned with sodium arsenite. These areas have in certain instances shown up a high incidence of the root disease, which has infected the new stand of rubber to an alarming extent. We are aware that several hundred acres of land replanted after the poisoning of the old stand have been affected in this way on a single estate. The appearance of the root disease in areas, where the old rubber has been completely uprooted with attention to affected trees, has been negligible.

Bark Diseases:

With the attainment of full foliage in recent years as a result of systematic Oidium control, bark diseases have been reported from many estates during periods of wet weather. The appearance of Bark Rot and Canker in epidemic proportions is invariably due to incorrect use of fungicides during the susceptible periods. The use of only waterproof dressings during wet weather has been found to be ineffective and it is essential to use water miscible fungicidal applications at the correct 'preventive' and 'curative' concentrations for effective control of bark diseases. The treated areas are further protected with applications of waterproof dressings during a spell of dry weather.

'Secondary' Leaf Fall:

Arising from better foliage conditions and pod-set, isolated cases of 'heavy secondary' leaf fall due to Phytophthora palmivora have occurred. The leaf fall has, however, been confined to particular areas on estates depending on atmospheric conditions and environment. These isolated cases do not, however, warrant any serious consideration of large scale control measures with fungicides by dusting or spraying at the present time.

A series of new advisory circulars on the more important rubber diseases have greatly eased the advisory work of the Mycological Department. These circulars have been prepared by Dr. H. E. Young, the Director, for the Mycological Department in 1954.

DETAILED REPORT

Staff:

The Mycologist, Ir. J. H. van Emden, resigned his post in May, 1954 at the conclusion of the Oidium season and the writer assumed duties as Acting Mycologist in the same month in addition to his own duties as Botanist.

Mr. D. M. Fernando, Assistant Mycologist, was on duty throughout the year. He carried out preliminary laboratory investigations and small scale field investigations on fungicides. Later in the year at the request of the Board he postponed his end of contract leave and agreed to supervise the departmental work on Oidium control in 1955.

Mr. H. L. Munasinghe, Laboratory Assistant was on duty throughout the year.

Mr. E. G. Mendis, Laboratory Assistant, assisted the Mycologist in Oidium control experiments on outside estates. He was occupied in the second half of the year, collecting data on Oidium control from estate returns on a questionnaire sent out in 1954.

Correspondence:

The major part of the correspondence in the first half year was confined to problems connected with the control of Oidium heveae and allied subjects, which were dealt with by the Mycologist.

Correspondence in general was connected with Advisory work on diseases of rubber.

Inward	...	636
Outward	...	352

Visits:

30 Visits were made to outside estates and 4 to company agents in Colombo by the Mycologist.

Publications:

(1) Advisory Circular No. 32 (Revised October, 1954). 'Crown Budding for Oidium Resistance'.

(2) Advisory Circular No. 41, 'Pink Disease'.

(3) Advisory Circular No. 43, Superseding Circulars Nos. 22 and 28. 'Oidium Leaf Disease'.

(4) Advisory Circular No. 44, 'Diplodia Dieback and Collar Rot of Hevea and Blue Spot of Crepe Rubber'.

(5) Advisory Circular No. 45, 'Phytophthora Leaf Disease and Stem Dieback of Hevea'. (Mr. D. M. Fernando).

(6) Advisory Circular No. 46, 'White Root Disease of Hevea' Leptoporus lignosus (Fomes lignosus).

(7) Advisory Circular No. 47, 'Ustulina Rot of Rubber Trees'.

(8) Advisory Circular No. 48, 'Brown Root Disease of Hevea 'Fomes Lamaensis'.

(9) Advisory Circular No. 50, 'Orange Gall of Hevea'.

(10) Advisory Circular No. 51, 'Bird's Eye-Spot of Hevea', Helminthosporium heveae.

FIELD EXPERIMENTS

1. 1948 Clearing Hedigaila, Crown-Budding on Twin-Seedlings:

Twin seedlings of clones Tjir 1, PB 86, Mil 3/2, Glen 1 unselected seed, and unpaired seedlings as controls were planted in June, 1948. The twin pairs were crown-budded with clone Tjir 1 and Clone LCB. 870 the Oidium resistant clone at a height of 8 feet after approximately $1\frac{1}{2}$ years growth in 1949. There are 220 comparisons available for studying the effects of crown-budding with a high yielding crown of clone Tjir 1 and a low yielding crown of clone LCB. 870 on seedlings.

The growth measurements are summarised in Table I.

TABLE 1

1948 Clearing, Hedigalla, Crown Budding on Twin Seedlings

Mean Girth in Inches

Year	Clone Tjir 1 Crowns		Clone LCB. 870 Crowns	
	Girth	Increase	Girth	Increase
1950	5.36		5.53	
1951	6.18	0.82	6.35	0.82
1952	9.76	3.58	10.05	3.70
1953	12.87	3.11	13.00	2.95
1954	16.03	3.16	16.53	3.53

There are no differences in growth of the twin pairs with the crowns of low yielding and high yielding clones. Both clones Tjir 1 and LCB. 870 have heavy crowns and the growth is mainly influenced by this factor.

In 1953 a preliminary test-tapping on the Morris-Mann system of early tapping showed no differences in yield between the twin pairs. This area will be taken into normal tapping in 1955, restricting the initial opening of cuts to twin pairs in which both trees have reached tappable girth.

Breeding for Resistance with clone LCB. 870

1952 Replanted Area, Dartonfield, $3\frac{3}{4}$ Acres:

The 1951 hand pollinated seedlings using clone LCB. 870 and high yielding clones are planted on the avenue system in this area at a high initial stand per acre spaced $5' \times 30'$.

An early attempt to select the high yielding seedlings by Testatex method indicated that most seedlings were in the lowest yielding class. This was partially attributed to a new type of testatex knife, which was unsatisfactory for 'clean' pricking.

The incidence of Oidium on the trees will be observed from year to year. It is hoped that with a Morris-Mann system of early tapping of young trees the poor yielders will be uprooted for final observations of Oidium resistance on the remaining high yielding crosses.

1953 Hand Pollinations with clone LCB. 870:

The seedlings obtained from the 1953 hand pollinations were planted at Hedigalla Estate in 1954 spaced $3' \times 30'$. The general procedure for future observations will be similar to that adopted in the 1952 replanted area at Dartonfield.

1953 Hand Pollinations with clone LCB. 870:

A total of 5,084 crosses were made with clone LCB. 870 and other high yielding clones, 2,059 seedlings were established in the nurseries. 675 of these seedlings were planted on Hedigalla Estate in 1954. The remainder will be test pricked on the 'Testatex' method for selecting the high yielding seedlings for planting in 1955.

No special hand pollination programme was carried out for the Mycological Department with clone LCB. 870 in 1954.

Laboratory Investigations

After his return from a post-graduate course in plant pathology in the MacGill University, Canada, the Assistant Mycologist carried out preliminary investigations on some of the new fungicides represented by organic proprietary preparations of carbamates and crotonates. Preceded by a preliminary cursory survey of the epidemiology of the more important rubber diseases, caused by Phytophthora palmivora, Gleosporium, Oidium and Helminthosporium, he has carried out laboratory tests of 'in vitro' control. These tests have only been used as a preliminary guide for the initiation of field trials in the future. The 'in vitro' research on fungicides has however strict limitations for practical application on diseases of rubber.

The Laboratory Assistant carried out investigations on the life history of a Synchytrium causing the wart disease of Desmodium ovalifolium. There are signs that this disease is now causing a fair amount of damage on well established covers of Desmodium on estates and it is hoped that the final economic importance of the incidence of this disease can be fully assessed during the next few years. A paper on this new species of Synchytrium has been submitted by Mr. Munasinghe, Laboratory Assistant, for publication in a Quarterly Circular Publication.

Isolation of root nodule bacteria of the various cover crops of rubber in Ceylon were made in 1954. The efficiency of good strains of 'rhizobia' imported from Malaya and Britain will be tried out on a small scale on the local cover crops, which have been planted out in rubber plantations in this country.

Laboratory observations were made on the following diseased specimens sent in during the year 1954, in connection with advisory work:—

	No. of specimens
(Fomes) Leptoporus lignosus ...	6
Poria hypobrunnea ...	2
Ustulina zonata ...	2
Botryodiplodia theobromae ...	2
Phytophthora palmivora ...	4
Oidium heveae ...	9
Gleosporium alborubrum ...	1
Synchytrium desmodiae ...	2
Insect pests—Caterpillars, mites and scale insects ...	9

With the publication of a number of advisory circulars on diseases the numbers of specimens sent in have considerably diminished in recent years.

APPENDIX

NOTES ON THE INCIDENCE AND CONTROL OF OIDIUM HEVEAE IN CEYLON

By

Ir. J. H. Van Emden

1. Incidence:

1.1. Environment.
1.2. Clonal susceptibility.
1.3. Manuring.

2. Control:

2.1. Indirect control.
2.2. Direct control.
2.2.1. Dusting.
2.2.2. Spraying.
2.2.3. Comparison between dusting and spraying.
2.3. New and promising fungicide.

1. INCIDENCE OF OIDIUM HEVEAE IN CEYLON

1.1. Environment:

Oidium can occur with disastrous effects in all rubber growing districts of Ceylon and is not limited to the higher elevations. The difference between higher and lower elevations is, that in the former Oidium may be found throughout the year, while in the latter the fungus is usually inconspicuous except during the refoliation period after wintering.

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Mildew is also more difficult to control at higher elevations and due to its continuous attacks on young leaves, the long term effect on the trees is much more serious. A further difference is, that many clones, which show a reasonable degree of resistance to Oidium in the low-country, do not show this favourable characteristic at the higher elevations or do so to a much lesser degree. For instance, clone PB 86, which is hardly ever seriously affected in the low-country, may suffer considerably at higher elevations. Even LCB. 870 which is highly resistant at the altitudes where rubber is normally grown, may be badly attacked above 2,000 feet.

It is not known what conditions are responsible for the epidemic occurrence of Oidium. The fact, that during the period of refoliation of the rubber plantations after wintering, the abundance of susceptible material leads to a high concentration of inoculum in the air, is at least partly responsible for the omnipresence of Oidium towards the latter part of the refoliation season, but the sudden increase in severity, which can often be observed, suggests that some change in the weather brings about the combination of conditions needed for epidemic occurrence of Mildew.

There are indications, that a dry refoliation period makes for a light Oidium-season, while a wet refoliation period is favourable for a more severe occurrence of Mildew. Whether this is due to the high relative humidity, or to the fewer hours of sunshine or to the removal of sulphur dust from the leaves by rain showers is not known. Oidium diseases are generally considered

to be worst in the dry weather, but in the literature on powdery mildews records may be found of observations which support the view, that a high relative humidity, possibly combined with a favourable temperature furthers the occurrence of powdery mildews on crops and also favours germination of spores in vitro. (LAST, NILSSON, NISHIKADO).

1.2. Clonal Susceptibility:

After the 1953 season an analysis was made of the reports on the incidence of Oidium according to clones and it was found, that the differences were considerable. Because the reports of the 1954 season have not yet come in, a complete picture of the position in 1954 cannot yet be given, but from the available data it appears that last year's observations will be confirmed. If sufficient data become available for a number of years, a fairly accurate picture will be obtained for the susceptibility of all clones in general use. TJ. 1 was badly affected in 1954 and appears to be even more prone to Oidium than BD. 5; possibly because it combines susceptibility with the habit of late wintering, whereas BD. 5 is one of the earliest winterers. The slow recovery of this clone however greatly offsets the advantage of the early start. PB. 86, PR. 107 and HC. 28 escaped lightly in 1954 and several favourable reports of MK. 3/2 were received.

With regard to LCB. 870 it can be reported that this clone remained free from Oidium at Kepitigalle Estate at 1,580 feet without application of sulphur. Hence although LCB. 870 may be severely affected by Oidium at 2,000 feet as was reported above, it again proved its resistance for the normal rubber-producing area.

1.3. Manuring:

There is no experimental evidence with regard to the influence of manuring on the susceptibility of Hevea for powdery mildew. Experience with other crops however indicates, that manuring with nitrogen brings about an increased sensitivity to the disease. LAST states, that after nitrogen manuring of wheat a period of increased sensitivity occurs, which however passes away.

HOPFENGART found, that particularly nitrates (as opposed to ammonium salts) increased the sensitivity of Barley, while potassium manuring resulted in a decreased sensitivity.

TAPKE, also working on Barley, states, that conditions making for succulent growth, such as subdued light, plenty of moisture and liberal nitrogen make for susceptible plants.

The above should not discourage anyone from manuring his rubber, because manuring influences in the first place, growth, bark renewal and probably yield. Besides, given a clone of average susceptibility and normal growing conditions, the available method of direct control should be sufficient to prevent Oidium-damage. The above is however of importance to those who think, that manuring can take the place of sulphur-dusting. From the above it is quite clear, that this cannot be the case. The practice of giving large quantities of nitrogen immediately before the wintering season, which is found on a few estates, must be considered a dangerous procedure. It should be understood that unless there are plenty of leaves on a tree, there is very little to be gained from heavy manuring. On the other hand, if the trees carry good foliage, they are in an excellent position to utilize the available mineral nutrients. *If an estate finds itself in the position, that it is financially impossible to control Oidium and to manure over the entire area, it should not choose between either sulphur-dusting or manuring, but it should carry out both operations on the most valuable fields, as far as funds permit.*

CONTROL OF OIDIUM

2.1. Indirect Control:

The cheapest way of controlling Oidium is by growing resistant varieties, provided they are on the same level of productivity as the average modern planting material.

For the time being we have no such varieties and although a few thousand cross pollinations of LCB. 870 are available at the Institute for selection, the chances that a new clone answering the requirements for resistance and productivity will be shortly available are rather remote.

An alternative to growing a resistant clone is crown-budding existing high yielding clones with a resistant crown.

The cost of crown-budding is rather high, but could be reduced (*a*) by adopting a system of hedge or avenue planting and (*b*) by reducing the height of crown-budding from 8 to 6 feet. This latter step would not only reduce the cost of the operation itself, but would also make it possible to carry out the operation at a younger stage, thus saving time and consequently also money. It should however be emphasized, that reducing the height of crown-budding may have an unfavourable influence on production and until more is known about the influence of the crown on the production of the centre section, it is not advisable to deviate from the recommended height of 8 feet. The matter is however mentioned here because of the advantages which would result if crown-budding at six feet instead of at 8 feet could be permitted.

While dealing with the matter of crown-budding it should be pointed out, that in those countries where *Dothidella ulei*, the South American Leaf Blight is prevalent, crown-budding is a necessity, if any rubber is to be grown at all (until resistant hybrids become available). Since rubber plants, low yielding, but resistant to S.A.L.B. and hence suitable for crown-budding only, will become available to the R.R.I. very soon, the use of this material in preference to LCB. 870 deserves serious consideration with a view on the possibility that the South American Leaf Blight may enter the country at any time.

The system of hedge or avenue planting mentioned above deserves to be considered by everybody interested in the control of Oidium, not only because cost of crown-budding would be reduced, but also because application of fungicides, especially of sprays, would be greatly facilitated. Also we can expect, that the spacing of trees according to the hedge planting system will make conditions for Oidium less favourable by allowing better circulation of air and hence a quicker drop in the relative humidity of the air in the field.

It should be said here, that hedge planting has been practised now for a number of years on an experimental scale, both in Indonesia and in Malaya and that no adverse effects on yield have been discovered. True enough not all clones are suitable for this system of planting. Clones with a leaning habit such as for instance TJ. 16, lean badly when spaced closely in the row, but there are a number of clones which show no undesirable characteristics if grown in hedges. The pictures published by SCHWEIZER in the 'Archief voor de Rubbercultuur 1951' illustrate these differences very well.

2.2. Direct Control.

2.2.1. Dusting:

At the end of the 1953 Oidium season the conclusion was reached that according to standard recommendations (*i.e.* five rounds of twelve pounds of sulphur per acre at one week's interval) gave a satisfactory control of Oidium

on average clones and under average circumstances, but was insufficient if the more sensitive clones were concerned or if conditions were unfavourable. This conclusion was confirmed during the 1954 season. It was again found, that if the incidence of Oidium was naturally light, dusting according to standard recommendations gave good protection. If however the attack was severe the protection was insufficient.

In an experiment in which the falling leaves were caught on sample areas of 9 square feet, it was found, that dusting once a week at a rate of 12 lbs./acre reduced the leaf fall to 50 per cent. of what it was in the untreated area. Dusting twice a week at the same rate reduced the leaf fall to 30 per cent. as compared to the control.

It was attempted to increase the efficiency of dusting by (*a*) incorporating a dust sticker in the sulphur, (*b*) by using so called redispersible sulphur. The use of the sticker did not bring about a notable improvement. Since this substance was admixed locally, its distribution may have been poor and it is recommended that sulphur powders with machine-mixed stickers be tried in future. Redispersible-sulphur powders are really wettable-sulphur powders made into a form in which they can be applied as a dust. The idea is, that the sulphur caught on the leaves will go into suspension as soon as the leaves get wet by dew or otherwise, thus producing an effect similar to that obtained with a spray. This redispersible sulphur has now been tried for two years in succession and the result has been disappointing. As the idea appears sound enough it is expected that the manufacturers will try to improve on their present product and redispersible sulphur powders should be kept in mind for future experiments.

A future improvement in dusts may be obtained by addition of another fungicide to the sulphur dust. This possibility will be discussed below under 2.3.

2.2.2. Spraying

In 1953 it was found, that spraying with either wettable sulphur at 4 lbs./acre/week or with lime sulphur at 1½ gall./acre/week gave practically complete protection on the trees which were actually sprayed. In order to reach all trees it was necessary with the then available machine (Micronsprayer) to take it along every second row. It was hoped, that if more powerful machines would become available a much greater depth of treatment could be achieved so that a swath-width of about 100 feet could be obtained.

In 1954 two large mistsprayers were available to the Intstitute, one was Messrs. Drake and Fletcher's 'Mistejecta' and the other Messrs. Birchmeier's 'Biatom 111'.

In this season it was again found, that the trees actually reached by the spray remained virtually free from Oidium, but it was also found, that the depth of treatment (range) even of these big machines was not more than between 60 and 70 feet. Also it was found, that in order to obtain the necessary range and a sufficiently dense coverage, the forward speed of the machine should not exceed 1 m.p.h. This limits the capacity of the large machines mentioned above to 8 acres per hour (in ordinary square planted rubber). Hence although spraying again proved its efficacy as a method of Oidium control, the application difficulties appear to be even greater than was anticipated.

2.2.3. Comparison between dusting and spraying.

2.2.3. 1. The control aspect:

Dusting and spraying were compared in two field experiments.

(*a*) **Experiment on Clone BD. 5.**—About 24 acres of BD. 5 were divided in twelve plots of two acres each (tapping tasks).

Of these twelve plots six were sprayed (two kinds of spray, each replicated three times) three were dusted and three were left untreated.

In this field Oidium was very light and the leaf fall was negligible. Hence no leaf counts could be taken and Oidium had to be assessed by classing a number of sample leaves according to the amount of Oidium spotting on them.

Samples were taken by collecting the lowest stem shoot of every fifth tree except from the two border rows on all sides.

As in the previous year, when this field underwent a similar treatment five classes of spotting were distinguished:—

(1) No spots
(2) Very few spots
(3) Few spots
(4) Many spots
(5) Leaves incomplete through loss of one or more leaflets.

It is considered that only leaves in classes (4) and (5) were seriously impaired in their physiological activity.

The assessment showed the following results:—

Class	Spray treatment (1)	Spray treatment (2)	Dusting	Control
(1)	2	—	—	—
(2)	28	26	19	12
(3)	33	38	20	25
(4)	37	36	61	63
(5)	—	—	—	—

The above figures, although showing the superiority of the spray do not do justice to the treatments as they do not express the difference in appearance of the foliage which may be observed on the spot. Unfortunately there is not an objective means of expressing differences in appearance.

(*b*) **Experiment on clone TJ. 1.**—This experiment consisted of 24 plots of about two acres each.

Treatments:—

(1) No treatment.
(2) Dusting with yellow sulphur no duststicker added, 12 lbs./acre/week.
(3) Dusting with yellow sulphur with duststicker added 12 lbs./acre/week.
(4) Dusting with yellow sulphur, no sticker, 12 lbs./acre twice a week.

(5) Spraying with 6 lbs. Thiovit in 6 gallons of water per acre per week.

(6) Spraying with 6 lbs. Aasulfa in 6 gallon water per acre per week.

(7) Spraying with 6 lbs. Colsul in 6 gallon water per acre per week.

(8) Spraying with 3 lbs. Aasulfa and $\frac{3}{4}$ gallon lime sulphur made up with water to make 6 gallons per acre per week.

In this experiment there was a heavy Oidium attack and practically all the leaves in the control plots came off.

The experiment was assessed by collecting the falling leaves on trays of nine square feet, put out at a rate of three trays per plot at a few days interval from the beginning of leaf fall.

In the number of leaves collected in the untreated area is put at 100, the leaf fall in the other treatments was as follows:—

Treatment	*Leaffall*
(1)	100
(2)	51
(3)	48
(4)	30
(5)	24
(6)	23
(7)	17
(8)	12

From the above figures the following conclusions may be drawn. The control achieved by dusting twice a week is of the same order as the control achieved with the two wettable sulphurs (Thiovit and Aasulfa). The mixture of Lime sulphur and wettable sulphur seems to be more effective than wettable sulphur alone. The colloidal sulphur paste 'Colsul' appears to be somewhere between the wettable sulphur and the mixture of lime sulphur and wettable sulphur.

2.2.3. 2. The aspect of cost:

The cost of dusting is well enough known from experience and may be estimated at Rs. 4/- per acre per round if the price of sulphur is 25 cts. per lb. and the rate of application is 12 lbs./acre. If we estimate the depth of treatment at about 100 feet and the forward speed for the machine at about $1\frac{1}{2}$ m.p.h. the area treated in 1 hour will be about 20 acres. If we assume two hours of actual dusting in a day the area covered in one day will be 40 acres. If we reckon with 6 days dusting a week one machine could cope with 240 acres if all rubber wintered simultaneously. Since, however, there are always early winterers and late winterers it will not be necessary to have a dusting machine for every 240 acres, but one machine will be probably be capable of serving 300 or 350 acres, (if dusting is to be done on weekly rounds only). If part of the plantation will need dusting twice a week as is very likely the number of machines will have to be increased accordingly.

The cost of spraying is not known from experience and can only be estimated. The experience gained by the R.R.I. as to the capacity of a spraying machine combined with data available from disease control on tree crops in Europe afford a basis to arrive at an estimate for the cost of spraying if this were to be done in Ceylon on Estate scale. According to figures quoted from the Dutch Year book of Horticulture (Tuinbouwgids 1953) the cost of spraying in orchards is as follows, expressed in Rs. per acre per round.

	Farm of 12.5 acres		Farm of 20 acres	
	If high-volume sprayer is used	If small mistsprayer is used	If sn all mistsprayer is used	If large mistsprayer is used
Depreciation and interest	4.50	9.00	5.60	9.40
Maintenance and repair	1.10	1.10	0.68	1.10
Use of tractor	3.00	1.50	1.50	0.95
Fuel, tractor and sprayer	3.60	2.00	1.40	1.50
Chemicals	17.50	12.00	12.00	12.00
Labour	5.00	2.50	2.50	1.55
	34.70	28.10	23.68	26.50

From these figures we see, that a farm of 12.5 acres is considered large enough to purchase a high volume sprayer or a small mistsprayer for its own use. Apparently a large mistsprayer is considered justifiable if the size of the farm is 20 acres. The price of a small mistsprayer is given as Rs. 6,000/-; the price of a large mistsprayer as Rs. 9,500/-.

The capacity of the small mistsprayer is given as $1\frac{1}{4}$ acre/hour and of the large mistsprayer as 2 acres per hour.

Both machines are written off in five years time, because it is expected that the machinery will have become obsolete in that time.

The number of spray applications is ten per year.

This means that the large sprayer is written off after 500 hours of spraying and the small sprayer after 800 hours on the large farm and on the small farm after 500 hours.

How would these figures work out for Ceylon?

The cost of the type of sprayer used in the R.R.I.'s experiments is estimated at Rs. 10,000/-. The capacity is 8 acres per hour. If night spraying is done as well as day spraying, the capacity for the machine may be estimated at 50 acres per day. If weekly rounds are to be done and we estimate 6 days of spraying in a week, the machine could cope with 300 acres. If we assume that 5 rounds of spraying have to be done the machine would spray 1,500 acres a year in 250 hours of spraying. If the machine is written off in 1,000 hours, depreciation will be approximately Rs. 2/25 per acre.

For cost of maintenance and repair we may safely retain the European figure, because although these costs will undoubtedly be higher in Ceylon than they are in Europe if considered per hour, the greater capacity in Ceylon (8 acres/hour as compared to 2 acres/hour) offsets this difference. The same is true for the items 'use of tractor' and 'costs of fuel'. The item 'chemicals' will be Rs. 6/00 (*i.e.* 6 lbs. Wettable S at Rs. 1/- per lb.). The cost of labour may be estimated at Rs. 0.50/acre, (*i.e.* two skilled men Rs. 7/50 per day and four labourers at Rs. 2/50 per day, for 50 acres). The total amount will then be made up as follows:—

Depreciation and interest	...	Rs.	2.25
Maintenance and repair	...	,,	1.10
Use of tractor	...	,,	0.95
Fuel	...	,,	1.50
Chemicals	...	,,	6.00
Labour	...	,,	0.50
		Rs.	12.30/acre/round

To this amount has to be added the cost of putting in the necessary roads. On easy land these roads can be made at a cost of Rs. 2/50 per chain (as was done at the R.R.I. estate, Nivitigalakele).

It follows, however, that even after the roads have been paid for, one round of spraying is three times as expensive as one round of dusting. Hence spraying is not economical on all rubber where Oidium can be controlled by dusting once a week.

Even if two or three rounds a week are necessary spraying will still be more expensive.

This means, that unless an entirely different type of sprayer becomes available, which would be cheaper to operate, there is no purpose in considering spraying for the average rubber estates. Spraying may be considered on estates where due to elevation dusting is not effective or in estates planted in hedges or avenues, where spraying would be cheaper than in the case of normal square or rectangular planting.

2.3. New and Promising Fungicide:

For the first time since the discovery of sulphur as a fungicide against powdery mildews a new chemical has been developed of which it is claimed that it is especially effective against the Oidium fungi. The name of the new chemical is 'dinitrocaprylphenylcrotonate'; it is also known under the trade names 'Mildex' and 'Karathane'. Experimental quantities were obtained from U.S.A. and the initial experiments, using the substance as a spray as well as mixed with dusting sulphur have been encouraging. Experiments will be carried out on a larger scale in the July-August refoliation season in the Moneragala area. The necessary quantity of the chemical will be imported by one of the Colombo firms, who are agents for this fungicide. If the experiments referred to, prove successful larger quantities will probably be available for more experiments in the next wintering season.

Recommendation:

Resulting from the present knowledge the R.R.I. Ceylon recommends for the next refoliation season that commercial estates should provide for:—

(*a*) One round of dusting with sulphur per week at 12 lbs. per acre in the case of light attacks of Oidium.

(*b*) Two rounds per week at 12 lbs. per acre per round in the case of heavier attacks.

(*c*) One machine per 300-350 acres in case of (*a*).

(*d*) Two machine per 300-350 acres in case of (*b*).

(*e*) As the occurrence of (*a*) and (*b*) cannot be predicted a safe estimate, to provide for 50 per cent. of the dusted area to be dusted twice a week and the rest once a week would be to provide one machine for each 250 acres and sufficient sulphur to dust at say $1\frac{1}{2}$ times the normal rate of 12 lbs. per acre for each of 5 to 6 rounds.

Acknowledgement:

The Institute is greatly indebted to Companies, Superintendents, and Assistant Superintendents of estates who have made the various field experiments possible by their co-operation.

REPORT OF THE AGRONOMY DEPARTMENT FOR THE YEAR 1954

By

D. H. Constable

SUMMARY:

Staff was augmented by a laboratory assistant, an attendant and a daily paid field attendant. The first of these proved unequal to the work and was replaced in June by an attendant with suitable educational qualifications for the higher post.

Laboratory work has continued to be mainly upon leaf samples. We can identify Potash and Magnesium deficiencies with certainty and nitrogen with less certainty. We have not, so far, been able to characterise the Phosphate uptake status. So far only total nutrients in the leaf have been studied, but a beginning has been made on fractionation, and on use of other growing parts.

Manurial experiments have continued with the exception of Hewagam and Lochnagar. Clear figures supporting the desirability of NPK manure have been obtained and have been accepted by the majority of planters.

The existing experiments are, in most cases, being handed back to the estates and fresh experiments opened to check the type and amount of NPK manure.

New experiments of $3\times3\times3$ NPK type have been started at Padukka and Nakiadeniya. Three more estates two in Ratnapura and one in Southern Province are to have similar experiments opened in 1955.

With the use of higher Potash manurial mixtures and an inherent tendency of PB. 86, Magnesium deficiency is widespread. An advisory circular has been issued. We have evidence to show that it can be cured by Dolomitic Lime and we have had two examples of estates which are satisfied that an appreciable growth reaction has followed its use.

Potassium deficiency is becoming severe on quartzitic and infertile soils. An advisory circular on the subject is in print and likely to be issued by early 1955. There is good reason to believe that this deficiency can have a serious effect on yield and growth. We have successfully cured our first case and obtained an appreciable yield improvement. A 90 per cent. cure has been obtained in the second case after 18 months work.

We are hoping to get coloured reproductions issued of both Magnesium and Potassium deficiencies.

The weather continued as unpredictable as ever but we finally started the weedkilling at Ederapolla in November. A 100 per cent. kill of vegetation was obtained with two proprietary products containing pentachlorphenol. Further studies on this compound at various strengths are under way at both Ederapolla and Pimbura Groups.

A cattle repellent trial was made on two estates. The compound was effective but expensive and it was found that cattle were deliberately driven through a 'barrier' area onto unsprayed covers. The expense of spraying whole estates would be prohibitive.

A trial of home made latex stimulant was commenced. The first application was followed by most unusual rainfall in early October and it is probable that most of the compound was washed or driven off by the rain and high winds. A further application will be made after 3 months.

Various pot experiments were started during the year but did not progress satisfactorily.

The new laboratory has been completed by the Institute's staff and is proving a valuable addition.

DETAILED REPORT

Staff:

Mr. Jeevaratnam was reported on most favourably by his academic supervisors during the year. As a result an extension of his study leave was granted in order that he might proceed to an M. Agr. Sc. He will now return towards the end of 1955.

A laboratory assistant and an attendant were recruited in January the latter being an old employee of the Institute who was declared redundant some years ago. The laboratory assistant proved incapable of meeting the standard of work required and left in June.

It was decided to recruit a person, having the educational qualifications for the post of assistant, into the attendant's grade and give him a year's experience of laboratory work before promotion to the grade of assistant if his capabilities justified it. Action was accordingly taken on these lines.

The remainder of the staff were on duty throughout the year apart from normal periods of leave and sickness.

Laboratory Work:

Approximately 800 leaf samples have been collected during the year and analysed for N, P, K, Ca, and Mg. 50 soil samples have also been collected and some preliminary work carried out on them. 75 of the leaf samples were examined in connection with deficiencies and advisory work.

A report is in progress giving full details of the laboratory work on leaf samples from its inception in 1951 up to mid-1954. The main points of interest are that we can diagnose Potash status with certainty, and the existence of Nitrogen and Magnesium deficiencies. Low Phosphate values have also been recorded in severe cases involving an established deficiency of another element. It is not considered, at present, to be a reliable method for Phosphate.

We have not, so far, except for Potash, obtained overall clearcut differences or a degree of correlation between nutrient supply and leaf content. Clearings taken separately, generally show significant leaf variations with nutrient supply but values between clearings overlap. There appears to be a downward trend of leaf nitrogen with age.

There seems also to be a tendency for Magnesium content to increase with age. This latter may explain the fact that Magnesium deficiency symptoms in PB. 86 seem to disappear after about two years.

Laboratory work, on the areas diagnosed as Potash deficient, has continued. In the first case the entire area has returned to a normal colouration and leaf figures for N and K now average over 3.5 per cent. and over 0.75 per cent. respectively as against under 2.5 per cent. and under 0.30 per cent. at the start of the work. On the second estate after 15 months work a 90 per cent. cure has been obtained visually with average values of 3.0 per cent. and 0.50 per cent. as against 2.25 per cent. and below 0.20 per cent. originally. There seems no reason to doubt therefore the correctness of the deductions to be drawn from these figures. During the last quarter of the year several more cases were brought to our notice and it became possible to diagnose with certainty from the leaf appearance alone. Figures in Table I show average leaf values from a number of estates including those mentioned above.

TABLE I

Average leaf nutrient concentrations from areas diagnosed as Potassium deficient

As percentages of oven dried leaf.

Estate		N	P	K	Ca.	Mg.	Leaf treatment.
1	...	< 2.5	> .20	< .30	~ 1.0	> .20	Sieved
1	...	< 2.7	~ .15	< .40	~ .75	> .20	Sieved
2	...	< 2.5	< .15	< .20	~ 1.0	~ .40	Sieved
2	...	~ 2.0	< .15	~ .15	> 1.0	~ .35	Sieved
2	...	~ 2.0	< .15	~ .30	> 1.0	~ .40	Sieved
3	...	~ 2.0	< .20	~ .20	> 1.5	~ .20	Sieved
4	...	~ 3.0	< 20	~ .35	> 1.5	> .50	Sieved
5	...	< 3.0	~ .20	< .50	> 1.5	~ .25	Sieved
5	...	< 3.0	~ .20	< .40	1.0–3.0	.15–.52	Sieved
5	...	< 2.5	~ .15	~ .20	~ .75	~ .30	Sieved
6	...	< 2.0	~ .10	< .30	~ .90	~ .15	Sieved
7	...	< 3.0	~ .20	< .40	~ 1.0	~ .20	Sieved
			Above are 1951-53				
1	...	< 2.5	~ .15	~ .25	2.0–3.0	.6–.9	Milled
2	...	< 2.8	< .15	~ .30	~ 1.0	~ .25	Milled
3	...	2.4	.12	.26	1.4	.6	Milled
7	...	< 3.0	~ .20	< .35	~ 1.0	~ .20	Milled
8	...	< 2.5	~ .20	< .35	~ .80	~ .16	Milled
9	...	< 2.5	~ .15	< .35	~ 1.0	~ .35	Milled
10	...	< 2.5	~ .17	~ .35	~ 1.5	~ .45	Milled

Symbols > Greater than. < Less than. ~ About.

Table II shows the leaf average content for Magnesium deficiencies. It will be noticed that Estate E is both Potash and Magnesium deficient which is unique in our experience to date.

TABLE II

Average leaf nutrient concentration from areas diagnosed as Magnesium deficient

As percentages of oven dried leaf.

Estate	N	P	K	Ca.	Mg.	Leaf treatment.
Dartonfield ...	~ 2.5	~.15	> .75	~ 1.0	< .08	Sieved
A ...	> 3.5	> .20	> 1.4	> 1.5	< .10	Sieved
B ...	2.9	.19	.86	1.3	.10	Sieved
C ...	3.5	.24	> .75	> .75	~ .10	Sieved
D ...	2.5–3.0	> .20	> .50	> .75	< .10	Sieved
E ...	~ 2.0	~.18	~ .20	~ 1.5	< .05	Sieved
F ...	2.9	.17	1.2	1.0	.09	Sieved

Symbols > Greater than < Less than ~ About

Table III is provided as a comparison to Tables I and II and lists average leaf contents on the NPK plots of estates for samples taken during 1954.

TABLE III

Average leaf nutrient concentrations from various NPK plots on Commercial estates in 1954

As percentages of oven dried leaf.

Estate	N	P	K	Ca.	Mg.	Leaf treatment
Mirishena	3.12	.18	.76	1.26	.22	Wiley Milled
Ambatenne	2.75	.16	.58	1.52	.38	,, ,,
Epping Forest	2.78	.13	.64	1.07	.21	,, ,,
Degalessa	3.48	.20	.97	1.37	.24	,, ,,

The mention of leaf treatment is made in these three Tables because at the beginning of 1954 a Wiley Mill was substituted for hand grinding and sieving of the dried plant tissue. This latter treatment eliminated much of the mechanical tissue and led to slightly higher Nitrogen figures (by about .25-.50 per cent. absolute).

During the last half of the year leaf stalk samples have also been taken and analysis data recorded simultaneously for them. Attempts have been made also at fractionation of the nutrients but have not so far led to more useful figures than the present methods. It is hoped that the $3 \times 3 \times 3$ experiments will prove a more fruitful field for this work.

A number of soil samples have been taken and analysed for total nitrogen and phosphorus. The results are summarised in Table IV.

Since both Kepitigalla and Degalessa show strong nitrogen responses to applications of 150 lbs. Sulphate of Ammonia (30 lbs. Nitrogen) per acre, these figures (Table IV) obviously do not represent Nitrogen available to the plant.

TABLE IV

Soil analysis for total Nitrogen and Phosphorus

Estate	Total N % Average	Total P % Average	N in lbs. per acre to 6″ depth	P in lbs. per acre to 6″ depth	Actual Soil response if known as growth percentage.
Degalessa	.156	.039	3,120	780	P = 12%, N = 27%
Opata	.166	.021	3,320	420	
Vykumbra	.204	.063	4,080	1,260	
Moneragala	.098	.034	1,960	680	
Ambanganga	.137	.973	2,740	22,000	
Lochnager	.119	.069	2,380	1,380	P = 6%, N = nil
Kepitigalla	.085	.032	1,700	640	N = 14%, P = nil
Nakiadeniya	.137	.019	2,740	380	

NOTE.—Ambanganga sample is of a nursery given very heavy applications of wood ash.

Similarly the existence of phosphate responses on Lochnagar and Degalessa show that the total soil phosphate is not a direct measure of the phosphate status of the soil.

Field Experiments:

The following manurial experiments were under observation during the year:

(1) Dartonfield 19½ acres 1938 Clearing 2×2×2 NPK Experiment.

(2) Hedigalla 13½ acres 1952 Clearing Manurial/Clone Experiment.

(3) Hedigalla 13½ acres 1952 Clearing Clonal/Spacing Experiment.

(4) Ambatenne Clearing Manurial Experiment.

(5) Degalessa Clearing Manurial Experiment.

(6) Ederapolla Clearing Manurial Experiment.

(7) Epping Forest 1951 Clearing Manurial Experiment.

(8) Kepitigalla Clearing Manurial Experiment.

(9) Mirishena Clearing Manurial Experiment.

The following experiments were opened:—

(10) Padukka 1953 Clearing 3×3×3 NPK Experiment.

(11) Nakiadeniya 1953 Clearing 3×3×3 NPK Experiment.

Whilst agreement on opening in 1955 was made on the following:—

(12) Stokesland 1955 Clearing 3×3×3 NPK Experiment.

(13) Palmgarden 1954 Clearing 3×3×3 NPK Experiment.

(14) Mahawale 1954 Clearing 3×3×3 NPK Experiment.

The following were closed during the year:—

(*a*) Lochnagar Manurial Experiment due to sale of the estate.

(*b*) Hewagam Manurial Experiment due to rat damage.

Passara district is now the only rubber growing area that is not, or has not been, covered by field experimental work.

The following estates have been visited in connection with deficiency symptoms and/or poor growth.

(1) Opata, Kahawatta.
(2) Hunuwella, Pelmadulla.
(3) Rilhena, Pelmadulla.
(4) Niriella, Ratnapura.
(5) Nakiadeniya, Galle.
(6) South Charley Mount, Weligama.
(7) Bentota, Elipitiya.
(8) St. George, Kalutara.
(9) Usk Valley, Kalutara.
(10) Panawatte, K. V.
(11) Udabage, K. V.
(12) Golinda, Kegalle.
(13) Moneragalla, Passara.
(14) Vykumbra, Passara.

Towards the end of the year estates were asked to give their highest yields with mature PB. 86 and the acreage on which this yield was obtained. Interesting figures have been obtained which suggest that the majority of bearing PB. 86 has not had satisfactory cultivation for the conditions under which it was planted. Much of this is probably due to the recent World War.

The figures will be reported upon in more detail in a subsequent publication.

The weather continued as uncertain as in the previous year and the occurrence of the Monsoon seasons was completely altered. Consequently it proved almost impossible to obtain a synchronisation with Ederapolla to take advantage of the comparatively short spells of fine weather that occurred.

However a start was made in November and one block of eight plots was sprayed. Further work was not attempted as the work of spraying using 2 gallon knapsack sprayers proved long drawn out and it was obviously desirable either to use higher capacity spray equipment or low volume spraying. No useful reaction was obtained to 2.4D, 2.4.5T or M.C.P.A. in this trial. Both proprietary preparations (Monsanto & Shell) of Pentachlorphenol proved completely effective at their recommended strengths and eradicated all vegetation on their respective plots. Smaller trials with high pressure spraying

equipment are under way both on Ederapolla and Pimbura to determine the lowest amount of active material per acre and spray volume per acre for Penta Chlor Phenol together with another compound Amizol which has recently been received.

Results for the current year on the various manurial trials are given briefly in the following subsections.

A report covering the entire field manurial work of the Agronomy Department is in print and will be issued in due course.

(1) Dartonfield, 19½ Acres 1938 Clearing, NPK, Experiment

The figures for this experiment are set forth in Tables V and VI.

For girths there is no significant difference between compost and any of the phosphate containing treatments. NK is not significantly better than N but is better than Nil and K.

As treatment effects, P with an increase of 3.3 inches and N with 1.3 inches are significant.

TABLE V

Dartonfield NPK Trial 1938

Girths in inches 1954

	TJ 1	PB 183	HC 28	PB 86	PB 186	Average
O	26.1	24.4	27.9	25.0	23.3	25.3 ± .80
N	24.1	25.5	27.9	27.1	28.9	26.7
P	28.9	30.9	29.8	30.9	27.2	29.5
K	22.3	24.9	30.7	26.5	21.6	25.2
NP	28.8	29.1	30.8	29.0	29.9	29.5
NK	26.4	25.2	30.0	27.6	31.8	28.2
PK	27.5	31.4	32.2	27.7	28.5	29.5
NPK	27.6	29.0	33.2	31.2	30.0	30.2
Compost	30.8	30.8	31.3	31.3	32.3	31.3

	Order of Merit		Treatment effects	
Compost	31.3″ ± .8″		No	27.4″ ± .4
NPK	30.2		N_1	28.7
NP	29.5		P_0	26.4
PK			P_1	29.7
P			K_0	27.7
NK	28.5		K_1	28.3
N	26.7		N or K	28.1
O	25.3		NK	27.9
K	25.2			

TABLE VI

Dartonfield NPK Trial 1938

Yields in 1954 (corrected to a lbs per acre basis)

	TJ 1	PB 183	HC 28	PB 86	PB 186	Average
O	488	362	509	496	489	469
N	564	667	604	882	861	716
P	813	927	799	1,129	861	906
K	457	481	708	892	778	664
NP	1,146	546	791	916	1,003	880
NK	810	562	924	837	829	792
PK	755	863	868	687	853	805
NPK	884	529	628	950	819	761
Compost	758	1,190	502	1,000	884	866
Average	742	680	704	865	820	762

Order of Merit

P = 906 lbs/acre ± 90
NP = 880
Comp = 866
PK = 805
NK = 792
NPK = 761
N = 716
K = 664
Nil = 469

Treatment effects

N_0 = 710 lbs/acre ± 45 lbs.
N_1 789
P_0 660
P_1 839
K_0 743
K_1 756

With yields all treatments except K *alone* and N *alone* have given a significantly better yield than control. There is no significant difference between any of the treatments applied.

The phosphate effect of 179 lbs. per acre is significant but neither of the other elements approach significance.

All these effects are identical in significance with 1953. The deductions to be drawn from this experiment are that for Dartonfield area:

(1) Phosphate is essential for yield.

(2) Phosphate is essential and nitrogen desirable for growth.

(3) Potash *in combination* with other fertilisers has a small positive effect on both growth and yield.

(2) Hedigalla 13½ Acres, 1952 Clearing. Clonal/Manuring Experiment

This experiment consists of PB. 86, PB. 86 top budded LCB. 870, and AV. 255 as split plots within a 5×5 Latin Square of O, P, NP, PK and NPK manurial treatments.

The top budding commenced during the year and heights of 5 feet and 8 feet were used to give yield comparisons. Girths are reported in Table VII, for manurial treatments. Significant effects for Phosphate of 11 per cent. and for nitrogen in the presence of Phosphate of 7 per cent. are already clear, while, as in all our other manurial experiments, NPK is at the top of the list though not significantly above NP.

TABLE VII

Hedigalla Manurial/Clonal Trial 1952

Average girths in inches 1954

	PB 86	AV 255	LCB 870	PB 86/LCB 870	Average	
O	5.66	5.93	5.54	5.01	5.54 ± .125	
P	6.14	6.57	6.17	5.41	6.07	
NP	6.54	6.69	6.51	5.52	6.32	6.14
PK	5.80	6.36	5.89	5.16	5.80	
PNK	6.75	6.79	6.38	5.54	6.36	

	K_0	K_1		
N_0	6.07	5.80	5.93	.41 ± .08 = N effect
N_1	6.32	6.36	6.34	
	6.20	6.08		

— .12 ± .08 = K effect

Average Phosphate effect = 11%
Nitrogen = 7%

NOTE: The standard errors given above are calculated from the Latin Square data (which are not given) and not from the clonal/treatment interaction.

(4)-(9) Commercial Estates Manurial Experiments

Girths for 1954 are reported in Table VIII which is a copy of Table XVIII of the Field Experiments report. The detailed effects are as follows: Lochnagar significant Phosphate effect, Kepitigalla significant Nitrogen effect, Ederapolla significant NPK effect, Degalessa significant Nitrogen and Phosphate effects and significant effect of K on NP, Epping Forest significant Potash effect, Ambatenne significant Phosphate and Nitrogen effect, Mirishena significant Phosphate, Nitrogen and Potash effect.

Overall we have significant effects for Phosphate of $\frac{3}{4}$ inch, for Nitrogen of 7/10 inch, and for Potash of $\frac{1}{2}$ inch. In terms of percentage girth increases these are 11 per cent., 8 per cent. and 6 per cent. respectively and the combined effects which we are actually dealing with amount to P 11 per cent., NP 18 per cent. and NPK 26 per cent. after $2\frac{1}{2}$ years manuring. This percentage difference has increased considerably since 1953 so it is not unreasonable to expect an NPK effect approaching 50 per cent. to be manifest by the time the first trees are in tapping.

TABLE VIII

TREATMENT OF RESULTS 1954

Girths in Inches

Control	4.22	6.85	5.90	5.86	7.38	14.56	5.73	7.43	±	.23
P	4.49	6.81	5.96	6.57	7.91	16.32	6.95	8.17	±	.23
NP	4.68	7.67		7.85	8.16	16.97	7.33	8.77	±	.23
PK	4.57	6.86	6.79	6.60	9.82	16.32	7.19	8.56	±	.23
NPK	4.53	7.99		8.81	9.92	17.20	7.64	9.34	±	.23
N_o	4.53	6.84		6.58		8.86		16.32		7.07		8.37			
			> .99		> .75		> .18		> .77		> .42		> .69	±	.16
N_1	4.60	7.83		8.33		9.04		17.09		7.49		9.06			
K_o	4.58	7.24		7.21		8.03		16.65		7.14		8.47			
			> .18		> .50		> 1.84		> .11		> .28		> .48	±	.16
K_1	4.55	7.42		7.71		9.87		16.76		7.42		8.95			
N or K	4.62	7.26		7.22		8.99		16.64		7.26		8.66			
			> .15		> .49				> .12		> .03		> .10	±	.16
NK	4.51	7.41		7.69		8.91		16.76		7.29		8.76			

CF		2146.4712	
Total	... 29	430.0220	
Tr	... 4	12.2081	F = 9.37
Est	... 5	411.2981	
Error	... 20	6.5157	

It will be noticed that the difference of NPK over P is already 15 per cent. overall and is considerably greater on some of the individual estates, *e.g.* 33 per cent. on Degalessa and 25 per cent. on Epping Forest. Because of these results we have had no hesitation in condemning the use of Phosphate *alone* as a fertiliser for rubber under Ceylon conditions.

For more detailed results and conclusions the previously mentioned Report should be consulted.

(10)-(14) Commercial Estates Manurial Experiments

Padukka and Nakiadeniya Groups have had $3 \times 3 \times 3$ NPK experiments opened during April-July of this year. Levels of half, full, and double for Phosphate, Nil, full and double for Nitrogen and nil half and full for Potash are used. The expressions half etc. refer to the quantities normally given in R 4:6:5 applied according to our recommendations.

Areas on Stokesland, Palmgarden and Mahawale have been chosen and work on these will start in 1955.

Deficiencies:

During the year 14 estates were visited in connection with deficiencies and/or poor growth and/or yield.

Opata Group on which remedial manuring has been applied since 1951 has had no recurrence of the yellowing on the treated area. This area has recorded a yield of 1,527 lbs. per acre in 1954 on 12 acres as compared with 900 ± 50 lbs. per acre for the previous five years. No comparable rise in yields has taken place on other fields of the estate and it appears that the majority of this rise may be attributed to the manuring.

On South Charley Mount remedial manuring has proceeded and about 90 per cent. cure has been effected on the treated areas together with a corresponding rise in leaf analysis figures. A feature here is the impressive improvement in the appearance of the covers. The Superintendent reports an improvement in yield but the treated area is too small to permit an accurate assessment of this tendency.

Further symptoms of the Potash deficiency have occurred on other estates and remedial manuring has been recommended.

These cases taken with the manuring experiment in Epping Forest indicate a definite tendency towards Potash shortages on certain of the Ceylon soils. The cases of Opata, South Charley Mount and Epping Forest make it clear that such shortages can have an adverse effect on growth and yield. Having also succeeded in our remedial treatments it was considered highly desirable to acquaint the industry with the existence of this deficiency and the measures to be taken. Advisory Circular 37B has therefore been drafted and is in print. The final proofs having been corrected, issue should be early in 1955.

Magnesium deficiency also became widespread and Advisory Circular 37A was issued to cover this. It has been found both at Dartonfield and on a commercial estate that Dolomitic lime will disperse the symptoms in 6-9 months. Whether this is, in fact, cure of the existing symptoms, or the prevention of recurrence together with the shedding of existing deficient leaves, has not been studied. Also two cases have come to our notice in which the Superintendents consider that definite benefit to growth resulted from the use of Dolomitic Lime. One of these cases has been visited and even after making allowances for all factors there is a markedly more healthy appearance in the treated sector.

It is our opinion that Dolomitic lime might be advantageously applied at least once to all clearings up to ten years old, particularly as higher Potash manurial mixtures are in general use and must bear some of the blame for the Magnesium deficiency.

Due to the existence of the two forms of 'yellowing' each caused by an entirely different deficiency, we have decided that a recognition pamphlet is desirable. Coloured reproductions have been made of the different symptoms and arrangements made to produce these in quantity. A booklet is projected containing both photographs and full descriptions etc., which will be sold to the industry at cost price.

One case of Nitrogen deficiency was encountered during the year on a micaceous soil which had from 50-200 times the quantity of exchangeable Potash found in the majority of Ceylon soils. The clearings concerned had, for some time been manured with Saphos only. Temporary treatment with R 400 was recommended until the leaf discolouration had vanished followed by a mixture such as R 215 thereafter.

Owing to the wide spread of Potash deficiencies and the undoubted adverse contribution by R 400 (290 lbs. Sulphate of Ammonia 90 lbs. Saphos and 20 lbs. Muriate of Potash per acre) we are recommending the total abandonment of this formula for normal use by estates. The original conception under which this mixture was formulated *i.e.* that old rubber (seedling) responded almost solely to Nitrogen is now no longer of importance as comparatively little manuring of elderly rubber takes place. Also the soils have been much impoverished since the original clearing and responses are to be expected, and have been demonstrated, to all nutrients.

During the last part of the year a newspaper report gave considerable publicity to the use of Salvinia as a planting hole additive and erroneously ascribed certain opinions to the R.R.I. This matter was corrected but in view of the interest aroused, the planting concerned was visited and a report made which was circulated to the P. A. of Ceylon and the L.C.P.A. amongst others. Later the Minister for Agriculture was furnished with this report and our opinions. Briefly the growth on this planting was excellent but the quantities of manure applied had been even higher than our best recommendations. It seemed likely that the Salvinia acted as a sponge continuously supplying moisture to the young trees throughout the driest periods and permitting uninterrupted growth of the tree and its full exploitation of the fertilisers applied. In dry districts particularly we think its use likely to be of value but the cost of collection and cartage is likely to be high for properties not bordering infested waterways as this particular one was.

Miscellaneous:

A number of articles of general interest have been contributed to the Quarterly and others are in print.

Short talks have been delivered at P.A. meetings on the subjects of Saphos Manuring, Manuring by Spray, Salvina, and Deficiencies. Three meetings were attended.

Seventy eight days were spent visiting estates for advisory purposes and supervision of manurial trials.

Approximately twelve visitors other than planters were interviewed during the year.

Correspondence:

Inward	...	726
Outward	...	596

REPORT OF THE ESTATE SUPERINTENDENT FOR THE YEAR 1954

By

G. W. D. Barnet

SUMMARY

Buildings.—Building works not completed in 1953 were finished this year. Existing buildings were properly maintained. Extensions and improvements were effected to Intermediate Staff Bungalow No. 2 Servants' Lines, the Green-house, one Assistant Staff Bungalow at Nivitigalakele and three Assistant Staff Bungalows at Hedigalla. A new Intermediate Staff Bungalow is nearing completion and a new Dispensary and one Assistant Staff Bungalow have been built this year at Dartonfield, also six single water-sealed latrines.

New Machinery.—An additional electric motor for the standby water-pump was installed. Two sulphur-dusting machines were purchased for Nivitigalakele and Hedigalla Divisions and one additional watcher's gun for Hedigalla Division.

Electric Power & Water Supply.—The installation of the 160 KW. lighting set was completed early this year by Messrs. Harrisons Lister (Engineering) Ltd. The factory water supply was augmented by raising the dam to increase the storage capacity and by the laying of an additional 2-inch pipe line. A new well was completed to provide an additional water supply to the bungalows and laboratories on Dartonfield.

Dartonfield Group.—The total cultivated acreage of the Group was approximately 861 acres by the end of the year, of which $283\frac{3}{4}$ acres were tapped. The crop for the year amounted to 165,914 lb. representing a yield of 585 lb. per acre on the tapped area. The Immature areas amounted to $558\frac{3}{4}$ acres in 1954, of which 193 acres were planted in that year—5 acres in Dartonfield (replanting), 10 acres in Nivitigalakele (new planting) and 178 acres in Hedigalla (new planting). The budwood and seedling nurseries on the Group were $19\frac{1}{2}$ acres in extent. All replanting was done according to the experimental requirements of the Botany, and Mycology Departments and the Estate Superintendent was responsible for the practical side of this work and for the upkeep of the other immature areas and the nurseries. The issues of budwood to outside estates and the Smallholdings Department was attended to by the Estate Department.

Leptoporus lignosus and Fomes lamaensis root diseases were the biggest problems in all the replanted areas and the new plantings. Wind damage was fairly serious in the mature areas in Hedigalla Division. The control of *Oidium heveae*, phytophthora leaf-fall and *Corticium salmonicolor* (pink disease) presented no difficulties this year and the methods of control employed proved to be most effective.

All the mature and immature areas on the Group were manured in accordance with the Institute's recommendations. Most field and factory experiments were carried out with the help of the Estate Department Staff. The Visiting Agent Mr. J. D. Farquharson, inspected the Group twice during the year. The reports submitted by him to the R. R. Board on both occasions were very satisfactory.

The Rubber Controller's Nurseries at Egaloya, too, were in charge of the Estate Superintendent who was ably assisted by Mr. H. M. Buultjens, Officer-in-Charge of these nurseries.

Estimates for 1955 for Dartonfield Group were prepared by the writer and these were accepted by the R. R. Board after certain amendments had been made to them.

DETAILED REPORT

Visiting Agent.—The Visiting Agent, Mr. J. D. Farquharson, visited the Institute's properties on 17th/18th March and 24th/25th/26th August, 1954. Reports on these two visits were submitted to the Rubber Research Board.

Superintendent.—The writer was on duty throughout the year.

Staff.—Besides the writer, the Estate Department consisted of the following:

Estate Office.—Mr. T. S. J. Peiris (Head Clerk), Mr. A. C. Swaris (Accounts Clerk), Mr. E. T. Seneviratna (Correspondence Clerk), Mr. D. A. Jayasinghe (Check Roll Clerk) and H. David (Peon).

Rubber Factory.—Mr. W. A. P. Wanasinghe (Rubber Maker) left the services of the Institute on 30-9-54 having reached the age limit and Mr. O. de Alwis who was officiating as Assistant Rubber Maker & Store-Keeper succeeded him.

Dartonfield Division.—Mr. L. P. de Mel (Conductor-in-Charge), Mr. D. R. Colonne (Experimental Conductor), Mr. M. Abeyasinghe (Experimental Conductor), H. A. Haramanis (Estate K.P.), G. D. Seemon (Experimental Field Attendant), N. L. D. Ruban (Experimental Field Attendant), R. S. Sahayanesan (Experimental Field Attendant), K. S. A. C. Peiris (Experimental Field Attendant) and D. M. Wickremasinghe (Experimental Field Attendant).

Nivitigalakele Division.—Mr. J. Pitchamuttu (Acting Conductor-in-Charge), Mr. H. A. Mendis (Experimental Conductor), I. H. Stephen (Experimental Field Attendant), K. D. Thalis (Estate K.P.) and W. T. Silva (Experimental Field Attendant).

Hedigalla Division.—Mr. D. C. Kannangara (Conductor-in-Charge), Mr. K. D. Julius (Experimental Conductor), Mr. H. B. H. de Silva (Experimental Conductor), D. D. H. de Alwis (Estate K.P.) and K. D. Simon (Experimental Field Attendant).

Other Staff.—Mr. B. R. E. Mendis (Apothecary), Mr. T. C. Fernando (Senior Artisan), Mr. K. C. L. Fernando (Electrician), 3 Assistant Engine Drivers, 3 Car and lorry drivers and two school masters (Mr. S. Nadarajah at Dartonfield and Mr. D. F. S. Wickremasinghe at Hedigalla) were also on duty during the year.

R.R.S.S. Nurseries, Egaloya.—Mr. H. M. Buultjens continued to be Officer-in-Charge of these nurseries which are being run on behalf of the Rubber Controller. He was assisted in his duties there by A. K. Issanis (Experimental Field Attendant).

Acreage Statement—Dartonfield Group

Dartonfield Division:

		A.	R.	P.
No. 1 Field 1934 Replanted Area	...	7	2	16
No. 2 ,, 1936 ,, ,,	...	9	1	08
No. 3 ,, 1938 ,, ,,	...	19	0	37
No. 4 ,, 1939 ,, ,,	...	1	3	16
No. 5 ,, 1941 ,, ,,	...	5	3	18
No. 6 ,, 1947 ,, ,,	...	10	1	08
No. 7 ,, 1950/51 ,, ,,	...	26	2	30
No. 8 ,, 1952 ,, ,,	...	35	0	00
No. 9 ,, 1952 ,, ,, (Clonal Seedlings)	...	0	1	13
No. 10 ,, 1953 ,, ,, (Clone Museum)	...	14	0	00
No. 11 ,, 1954 ,, ,, (,, ,,	...	7	3	09
Old Seedling Rubber Areas	...	7	0	00
Seedling Nurseries	...	1	3	26
Cultivated Rubber Areas	...	146	3	21
Buildings and Sites	...	24	2	34
Roads	...	6	2	22
Streams and Reservations	...	0	0	29
TOTAL	...	178	1	26

Nivitigalakele Division:

		A.	R.	P.
No. 1 Field 1926 Clearing	...	13	0	00
No. 2 ,, 1927 ,,	...	10	0	00
No. 3 ,, 1928 ,,	...	15	3	28
No. 4 ,, 1935 ,,	...	30	2	28
No. 5 ,, 1939 ,,	...	10	1	01
No. 6 ,, 1940 ,,	...	9	2	39
No. 7 ,, 1940 ,, (Deniya)	...	3	0	24
No. 8 ,, 1941 ,,	...	7	0	26
No. 9 ,, 1942 ,,	...	4	3	11
No. 10 ,, 1943 ,,	...	7	0	00
No. 11 ,, 1944 ,,	...	4	2	22
No. 12 ,, 1946 ,,	...	21	0	31
No. 13 ,, 1953 ,,	...	9	3	25
No. 14 ,, 1954 ,,	...	10	0	30
Nurseries	...	13	3	10
Cultivated Rubber Areas	...	171	1	35
Buildings and Roads	...	2	0	15
Forest and Rocks	...	—	2	22
TOTAL	...	174	0	32

Hedigalla Division:

		A.	R.	P.
No. 1 Field 1943 Clearing	...	10	0	32
No. 2 „ 1944 „	...	11	3	14
No. 3 „ 1945 „	...	22	1	19
No. 4 „ 1946 „	...	12	2	38
No. 5 „ 1947 „	...	45	0	15
No. 6 „ 1949 „	...	34	2	38
No. 7 „ 1950/51 „	...	20	0	00
No. 8 „ 1952 Clearings	...	79	1	20
No. 9 „ 1953 „	...	141	3	29
No. 10 „ 1954 „	...	177	2	06
Nurseries	...	3	0	00
Cultivated Rubber Areas	...	558	3	11
Buildings and Roads	...	8	3	34
Forest and Streams	...	430	3	38
TOTAL	...	998	3	03

Abstract:

Cultivated Rubber Areas:

		A.	R.	P.
Dartonfield Division	...	146	3	21
Nivitigalakele Division	...	171	1	35
Hedigalla Division	...	558	3	11
TOTAL	...	877	0	27

Buildings & Roads:

Dartonfield Division	...	31	1	16
Nivitigalakele Division	...	2	0	15
Hedigalla Division	...	8	3	34
TOTAL	...	42	1	25

Forest and Streams:

Dartonfield Division	...	0	0	29
Nivitigalakele Division	...	—	2	22
Hedigalla Division	...	430	3	38
TOTAL	...	431	3	09
GRAND TOTAL	...	1,351	1	21

Elevation—Factory at Dartonfield—215 feet.

Rainfall.—Rainfall figures for 1950-1954 are shown below:—

Month	1950 *ins.*	1951 *ins.*	1952 *ins.*	1953 *ins.*	1954 *ins.*	*5 Years average* 1950-1954 *ins.*
January ...	2.05	13.21	5.03	3.75	11.66	7.14
February ...	5.77	2.12	8.40	5.12	9.62	6.20
March ...	9.51	11.61	6.63	15.21	17.46	11.48
April ...	11.40	14.60	11.69	10.10	17.13	12.98
May ...	16.38	23.40	18.00	4.96	30.10	18.57
June ...	9.48	23.20	13.69	6.79	6.47	11.93
July ...	9.31	23.54	2.50	34.69	8.55	15.72
August ...	8.36	1.76	6.92	6.67	9.78	6.70
September ...	11.30	18.57	8.70	8.87	10.54	11.59
October ...	26.88	11.98	19.08	24.28	28.66	22.18
November ...	7.14	17.80	12.30	15.17	10.76	12.63
December ...	2.54	5.03	16.01	11.93	19.32	10.97
	120.12	166.82	128.95	147.54	180.05	148.09

There were 211 wet days in 1954 against 205 wet days in 1953. May was the wettest month of the year with 30.1 inches in 29 days and October which received 28.66 inches in 25 days was a close second.

Rubber Crop:—

Yield Records of Individual Fields

	Acreage in tapping	*Total yield in lb.* 1954	1953	*Yield per acre lb.* 1954	1953
Old Seedling Rubber Area ...	—	—	—	—	—
1934 R'ptd. Area No. 1 Field ...	7½	7,511	4,979	1001.4	633.8
1936 „ „ No. 2 „ ...	9½	7,097	5,890	747.0	620.0
1938 „ „ No. 3 „ ...	19½	14,983	12,448	768.3	638.3
1939 „ „ No. 4 „ ...	2	1,631	1,255	815.5	627.5
1941 „ „ No. 5 „ ...	6½	5,129	4,385	789.0	674.6
1947 „ „ No. 6 „ ...	10¼	5,695	3,403	555.6	332.0
Total ...	55¼	42,046	32,360	761.0	585.7

Nivitigalakele:

	Acreage in tapping	*Total yield in lb.* 1954	1953	*Yield per acre lb.* 1954	1953
1926 Clearing No. 1 Field ...	13	7,247	8,068	557.4	620.6
1927 „ No. 2 „ ...	10	5,796	6,150	579.6	615.0
1928 „ No. 3 „ ...	15¾	9,142	10,704	580.4	679.6
1935 „ No. 4 „ ...	28½	19,702	22,218	691.3	779.5
1939 „ No. 5 „ ...	10¼	10,379	9,899	1,012.6	965.7
1940 „ No. 6 „ ...	9¾	9,755	6,872	1,000.4	704.8
1940 (Deniya) No. 7 „ ...	3¼	2,442	2,250	751.3	692.3
1941 Clearing No. 8 „ ...	7	8,574	7,238	1,224.9	1,034.0
1942 „ No. 9 „ ...	5	4,416	3,868	883.2	773.6
1943 „ No. 10 „ ...	3	1,555	987	518.3	328.3
1944 „ No. 11 „ ...	4½	3,882	2,620	862.6	582.2
1944 R'ptd. Area No. 12 Field ...	21	13,809	7,039	657.6	335.1
Total ...	131	96,699	87,913	738.2	671.1

Hedigalla:

1943 Clearing	No. 1 Field	...	10¼	8,164	6,353	796.5	619.8
1944 ,,	No. 2 ,,	...	11¾	8,492	5,588	722.7	475.5
1945 ,,	No. 3 ,,	...	22¼	3,911	2,736	175.7	260.5
1946 ,,	No. 4 ,,	...	12¾	3,630	2,714	284.7	339 3
1947 ,, (Part)	No. 5 ,,	...	40	2,972	—	74.3	—
	Total	...	97	27,169	17,391	280.0	429 4
	Total for the Group	...	283¼	*165,914	137,664	585.0	607.1
Test tapping "biscuits" from outside estates			—	267	—	—	—
	Grand Total	...	283¼	166,181	137,664	—	—

	1954 lb.	1953 lb.
Estimated Crop	152,200 ...	134,300
Harvested Crop	*165,914 ...	137,664
Excess...	13,714 ...	3,364

*This figure does not include 267 lb. of test tapping "biscuits" from outside estates.

Tapping.—Tapping was stopped on 1st February to rest the trees during refoliation and recommenced on 1st March. During the resting period new tapping cuts were marked in the budded rubber areas where changes of panels were necessary and where new areas were brought into tapping. The new field tapped this year was the 1947 clearing at Hedigalla.

Analysis of tapping rounds for 1954 (1953 figures in brackets)

	Early tapping	*Late tapping*	*Resting*	*No. tapping Rain*	*Holidays*
1st Quarter	46 (51)	12 (5)	30 (30)	2 (2)	2 (2)
2nd ,,	42 (72)	18 (9)	– (–)	24 (8)	2 (2)
3rd ,,	67 (52)	17 (23)	– (–)	8 (17)	– (–)
4th ,,	68 (61)	14 (26)	– (–)	10 (2)	3 (3)
Total for the year	223 (236)	61 (63)	30 (30)	44 (29)	7 (7)

Manufacture:

Latex Grades	*Total in lb.*	*Percentage*
Ribbed Smoked Sheets No. 1	17,561	10.56
,, ,, ,, No. 2	2,690	1.61
,, ,, ,, No. 3	232	0.15
Pale Crepe No. IX and No. 1	27,386	16.47
,, ,, No. 2	18,040	10.85
,, ,, No. 3	11,437	6.89
Sole Crepe No. 1	4,320	2.59
,, ,, No. 2	480	0.29
Creamed (concentrated) latex	51,574	31.03
Normal (ammoniated) latex	1,268	0.76
Latex for Chem. Dept. Experiments	178	0.13
	135,166	81.33

Scrap Grades		
Scrap Crepe No. 1	24,047	14.47
,, ,, No. 2	6,968	4.20
Total Scrap Grades	31,015	*18 67
Grand Total	166,181	100.00

*The percentage of Scrap grades is necessarily high on account of the large amount of test tapping 'biscuits' made twice per mensem in connection with experimental records of yields on individual trees.

Roads, Paths & Steps.—All roads, paths and steps were maintained in good condition throughout the year in the mature rubber areas.

Manuring.—All the trees in the mature areas on all the divisions were manured with R 4:6:5 manure mixture in two applications during the year at the rate of 1½ lb. per tree per application. The manure was lightly forked into the soil on both occasions.

Weeding.—All the mature rubber areas in tapping were weeded every other month during the year and are clean and tidy.

Pests & Diseases:

Bark Rot.—Applications of oily and water-soluble fungicides were made to the tapped panels of the trees in dry and wet weather respectively as a preventive against this disease. In some cases curative strengths of fungicides had to be applied.

Oidium heveae.—The incidence of this leaf disease was light. Sulphur-dusting operations were carried out in accordance with the recommendations of the Mycology Department with excellent results.

Fomes Lignosus.—(now classified as Leptoporus lignosus)—There were a few cases of this root disease in the mature rubber areas and these were treated in the recommended manner.

Fomes lamaensis.—A few cases occurred in the Hedigalla Division mature rubber areas and were attended to in the approved manner.

Ustulina deusta.—This disease caused the deaths of a few trees in all the Divisions.

Phytophthora palmivora.—The incidence of this disease, which causes secondary leaf-fall, was scattered and sporadic did not give cause for any anxiety on this estate.

Brown Bast.—All known cases were treated and rested. Those trees beyond redemption were slaughter-tapped and then uprooted and cut and stacked 'in situ'.

Canker Scraping.—Canker scraping was done where necessary and 10 per cent. Brunolinium Plantarium solution mixed with red powder was applied to the treated parts of the trees.

Corticium salmonicolor (Pink Disease). A few cases occurred in the younger areas in tapping and the affected trees were attended to in the recommended manner.

Wind Damage.— A large number of trees were blown down in Hedigalla Division and a few in Dartonfield and Nivitigalakele Divisions. Whenever possible these trees were pollarded and replanted.

The others were cut and stacked in 'situ'. There were several instances of branch and main stem damage, too, and these trees were attended to in the appropriate manner.

Details of all trees lost owing to various causes were given in the monthly reports of the Estate Department.

CAPITAL ACCOUNT—AGRICULTURAL DEVELOPMENT

1950/51 Replanted Areas—26¾ Acres—Dartonfield:

Weeding.—These areas were weeded once a month during the year and are clean and tidy.

Pests & Diseases.—*Leptoporus lignosus* root disease was the main cause of deaths of trees in these areas. The infected trees and their surroundings were attended to in the recommended manner. There were a few instances of Phytophthora disease of the leaves and green branches and these were attended too. A few cases of Corticium salmonicolor were treated.

Manuring.—R 4:6:5 manure mixture was applied at the rate of 1 lb. per plant per application in two applications during the year.

1952 Replanted Areas—35 Acres—Dartonfield:

Weeding.—These areas were weeded every month during the year and are clean and tidy.

Pests & Diseases.—A fair number of cases of Leptoporus lignosus root disease occurred in these areas. These were attended to in the recommended manner.

Manuring.—All the plants in these areas were manured with R 4:6:5 manure mixture at the rate of ¾ lb. per plant.

1953 Replanted Areas—14 Acres—Dartonfield:

Weeding.—These areas were weeded every month during the year and are clean and tidy.

Pests & Diseases.—A few cases of *Leptoporus lignosus* root disease and Phytophthora stem disease had to be dealt with in these areas this year.

Manuring.—The plants in these areas were manured three times during the year with R 4:6:5 manure mixture at the rate of ¼ lb. per plant per application.

1954 Replanted Area—4¾ Areas—Dartonfield:

Felling & Clearing.—This area was felled and cleared early this year.

Lining.—Pegs were put out to mark the planting points 8 feet apart with a distance of 300 feet between the rows.

Holing.—Planting holes were cut $1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{2}$ with a 1 foot alavango hole in the centre of each hole.

Filling Holes.—The holes were filled with top soil mixed with excavated earth free of large stones.

Grass & Shrubs.—All grass and shrubs were weeded out.

Cover Crops.—All bare areas were planted with rooted cuttings of *Desmodium ovalifolium*, tender cuttings of *Stylosanthes gracilis* and germinated seeds of *Pueraria phaseoloides* and *Flemingia congesta*. Guatamala grass too was planted along the contours 6 feet below the rows of plants.

Weeding.—This area was weeded once a month during the year and is clean and tidy.

Planting.—Clone Museum (continued) 16 budded stumps of each of the following clones were planted this year RLD. 16, RLD. 17, RLD. 18, RLD. 19, RLD. 20, RLD. 21, RLD. 22, RLD. 23, RLD. 24, RLD. 25, RLD. 26, RLD. 27, RLD. 28, RLD. 29, RLD. 30, RLD. 31, RLD. 32, RLD. 33, RLD. 34, RLD. 35, RLD. 36, RLD. 37, PB. 24/51, PB. 24/3, PB. 28/59, PBT. 207 and RLD. 8. Also Malayan clones and Indonesian clones which were received this year from the Rubber Research Institute of Malaya and Central Proefstations Vereniging and A.V.R.O.S. (Indonesia) respectively.

Manuring.—At the time of planting (*i.e.* S.W. Monsoon) each plant received 8 ozs. of Animal Meal manure. The plants were manured again three months later with R 4:6:5 manure mixture at the rate of 4 ozs. per plant. Six months after planting the plants received 4 ozs. R. 4:6:5 manure mixture per plant.

Drains & Silt Pits.—Old drains and silt pits in the area were cleaned out or re-cut as required.

Terraces.—Old rock terraces were repaired and new ones were built where necessary.

Supplying Vacancies.—All 'casualties' were replaced with budded stumps of the appropriate clones.

Boundaries.—The barbed wire fences on the external boundaries of the area were repaired where necessary.

1934 Clearing (burnt portion)—4 Acres—Nivitigalakele:

Weeding.—This area was weeded monthly during the year and is clean and tidy.

Pests & Diseases.—A few plants succumbed to *Leptoporus lignosus* root disease and were dealt with in the recommended manner.

Manuring.—This area was manured twice during the year with R 4:6:5 manure mixture at the rate of $1\frac{1}{4}$ lb. per plant per application.

1953 Clearing—$9\frac{3}{4}$ Acres—Nivitigalakele:

Weeding.—This clearing was weeded monthly during the year and is clean and tidy.

Pests & Diseases.—There were a few 'casualties' in this clearing mostly due to sun-scorch.

Supplying Vacancies.—All 'casualties' were replaced with stumped seedlings from the same source.

Manuring.—The plants in this clearing were manured four times this year with R 4:6:5 manure mixture at the rate of $\frac{1}{4}$ lb. per plant per application.

1954 Clearing—10 Acres—Nivitigalakele:

Felling, Burning & Clearing.—This work was completed at the end of last year on suspense account.

Lining.—Pegs to mark the planting points were put out at a distance of $20' \times 10'$.

Cutting Holes.—Holes were cut $1\frac{1}{2}' \times 1\frac{1}{2}' \times 1\frac{1}{2}'$ with an 'alavango' hole in the centre of each.

Filling Holes.—The planting holes were filled with soil mixed with excavated earth free from large stones.

Grass & Shrubs.—All grass and shrubs in the area were weeded out on this account.

Cover Crops.—Cuttings of *Stylosanthes gracilis* were planted in this clearing and are doing well. Hedges of Guatamala grass were established, too, along the contour and about 6 feet below the rows of plants.

Drains.—Silt-pitted drains were cut in accordance with the Institute's recommendations.

Planting.—200 budded stumps of each of the following clones were planted in 5 randomised blocks of 40 each:—

IR. 7, IR. 10, PB. 6/5, PB. 28/59, PBT. 207, PB. 24/51, PB. 24/3 and RRIM. 501.

Supplying Vacancies.—20 extra budded stumps of each of the clones used were planted in extra holes between the normal planting rows to be used later to replace casualties as stumped budgrafts.

Terraces.—The external boundaries of this clearing were fenced with Milla fence posts and barbed wire.

1947 Clearing (Crown-budded Twinned Seedling Area)—5 Acres—Hedigalla:

Weeding.—This area was weeded monthly during the year and is clean and tidy.

Manuring.—All the trees in this area were manured twice during the year with R 4:6:5 manure mixture at the rate of $1\frac{3}{4}$ lb. per tree per application.

1949 Clearing—34¾ Acres—Hedigalla:

Weeding.—This clearing was weeded monthly during the year and is clean and tidy.

Pests & Diseases.—Some cases of *Leptoporus lignosus* and Fomes lamaensis root diseases occurred during the year and these were dealt with in the proper manner.

Manuring.—The trees in this clearing were manured with R 4:6:5 manure mixture at the rate of 1¾ lb. per tree per application in two applications.

1950/51 Clearing—20 Acres—Hedigalla:

Weeding.—This clearing was weeded once a month during the year and is clean and tidy.

Pests & Diseases.—A few cases of *Leptoporus lignosus* and *Fomes lamaensis* root diseases, resulting in the deaths of trees, occurred during the year. These plants and their surroundings were suitably dealt with.

Supplying Vacancies.—All 'casualties' were replaced with stumped budgrafts of the appropriate clone.

Manuring.—All the trees in this clearing were manured with R 4:6:5 manure mixture at the rate of 1 lb. per plant per application in two applications.

1952 Clearing—79¼ Acres—Hedigalla:

Weeding.—These clearings were weeded monthly during the year and are clean and tidy.

Pests & Diseases.—Some trees succumbed to *Leptoporus lignosus* root disease. The affected trees and their surroundings were duly attended to.

Manuring.—The trees in these clearings were manured three times during the year at the rate of 12 ozs. per plant per application. The trees in the Agronomy Department Experimental areas were manured in accordance with the requirements of that Department.

1953 Clearings—142 Acres—Hedigalla:

Weeding.—These clearings were weeded monthly during the year and are clean and tidy.

Manuring.—All the trees in this clearing were manured four times during the year with R 4:6:5 manure mixture at the rate of ¾ lb. per plant per application.

Pests & Diseases.—A few plants died as a result of *Leptoporus lignosus* and *Fomes lamaensis* root diseases. These plants and their surroundings were attended to.

1954 Clearing—177½ Acres—Hedigalla:

Felling, Burning & Clearing.—This work, which was started towards the end of last year was completed early this year.

Lining.—Pegs were put out 8 feet apart along the contour with 30 feet between the planting rows.

Cutting Holes.—Planting holes were cut $1\frac{1}{2}' \times 1\frac{1}{2}' \times 1\frac{1}{2}'$ with an 'alvango' hole an extra 1 foot deep in the centre of the hole.

Filling Holes.—The holes were filled with top soil mixed with excavated earth free from large stones.

Drains.—Drains were cut only in the 'deniya' areas. The rest of the area will be drained after the logs on the land have rotted away.

Grass & Shrubs.—All grass and shrubs in this clearing were weeded out.

Cover Crops.—Rooted cuttings of Desmodium ovalifolium and germinated seeds of *Pueraria phaseoloides* were planted all over this area.

Planting.—In the Botanical Department Large Scale Clone Trial areas 800 budded stumps of each of the following clones were planted:—

RLD. 37, RLD. 36, RLD. 34, RLD. 33, RLD. 28, RLD. 16, RLD. 17, RLD. 18, RLD. 19, RLD. 20, RLD. 21, RLD. 22, RLD. 23, RLD. 24, RLD. 32, R.R.I.M. 501, PB. 86 and IR. 10. Also 840 budded stumps of each of the following clones:—

RLD. 35, RLD. 25, RLD. 26, RLD. 27, RLD. 29, RLD. 30 and RLD. 31.

855 clonal seedlings derived from hand-pollination, 106 budded stumps of clone PB. 86, 232 additional budded stumps of clone PR. 107 and 100 budded stumps of clone N.L. 1 were planted in an area outside the large scale clone trial.

In the Mycology Department Experimental area 1,180 budded stumps of clone AV. 255, 1,180 budded stumps of clone PR. 107 and 4720 TJ. 1 selfed seedlings were planted in accordance with the experimental requirements of that department. In the area outside the experiment 67 additional budded stumps of clone PR. 107 and 99 additional budded stumps of clone AV. 255 were planted.

Manuring.—Every plant received an application of 8 ozs. of Animal Meal manure at the time of planting and two applications of R 4:6:5 manure mixture 3 months and 6 months later respectively.

Notes.—The area to be planted this year was computed to be 148 acres (*i.e.* 138 as per original estimate and 10 acres extra to be planted at Hedigalla instead of at Dartonfield). The area actually demarcated by the previous Surveyor was the original 138 acres and the balance 10 acres had to be roughly computed. When the latest survey was completed in December this year it was found that the area planted in 1954 was $177\frac{1}{2}$ acres and not 148 acres. This partly explains why it was possible to plant additional planting material in this area.

Upkeep of Coffee interplanted in 30 acres of the 1949 Clearing—Hedigalla:

Weeding.—The cover crops were pulled back around each plant monthly during the year on this account.

Manuring.—All the plants were manured twice during the year with Animal Meal manure at the rate of $\frac{1}{2}$ lb. per plant per application.

Supplying Vacancies.—All 'casualties' were replaced with stumped coffee seedlings.

NURSERIES

Upkeep and Establishment of Seedling Nurseries—Dartonfield Group:

Preparing Beds.—The 5 acre nursery which was handed over to the Smallholdings Department a few years ago was taken over again by the Estate Department. Beds were prepared in this nursery.

Manuring.—All the plants in the nurseries were manured regularly in accordance with the Institute's recommendations. The newly prepared nursery beds were manured with Saphos Phosphate and Magnesium Lime, at the rate of 3 cwt. of Saphos Phosphate and 1 cwt. of Magnesium Lime per acre. The subsequent of Sulphate of Ammonia and Muriate of Potash mixed in a 4:1 proportion and applied at the rate of 1½ lb. per running year between the rows of plants.

Planting.—About 100,000 TJ. 1 selfed seedlings were planted in these nurseries and about 60,000 mixed clonal seedlings.

Cleaning Drains.—Drains were cleaned out where necessary and the silt from them was spread over the nursery beds.

Weeding.—All the seedling nurseries were weeded every month during the year and are clean and tidy.

Budding & Attention.– Budded stumps were prepared for the replanting and new planting requirements of the Group.

Upkeep and Establishment of Budwood Nurseries– Nivitigalakele:

Weeding.—These nurseries were weeded once a month during the year and were kept clean and tidy.

Manuring.—The plants in these nurseries were manured in accordance with the Institute's recommendations.

Planting.—New RLD. clones were planted in prepared beds and also clones imported from Malaya, Indonesia and Indochina.

Cleaning Drains.—All silted up drains were cleaned out and the soil spread over exposed roots of plants.

Pests & Diseases.—Some plants died as a result of *Leptoporus lignosus* root infection. The affected plants and their surroundings were attended to in the recommended manner.

Pollarding.—Budwood of various clones were sold to estates and smallholdings and budwood was also obtained from these nurseries for the requirements of the estate department. Budwood of selected clones were sent to Malaya, Indonesia and Indochina in exchange for the clones sent by those countries.

Labels.—Labels were affixed to the newly planted budded stumps in these nurseries. Name boards were put up in the various blocks of new clones in these nurseries.

Fencing.—Old fences were repaired where necessary and new ones were erected in accordance with the R.R.Board's regulations regarding budwood nurseries of the Institute.

FOOD PRODUCTION

Pineapples, Sweet potatoes and Manioc were grown and harvested and sold during the year on all the three Divisions and on some extra land at Egaloya.

FIELD AND FACTORY EXPERIMENTS

Assistance was given to the Agronomy Department in its manurial trials on Dartonfield and on outside estates.

The Botanical Department was afforded assistance in Test Tapping done on this and other estates. Sundry experiments in crown-budding and use of sundry cover crops were also done. This Department's planting programme was done by the Estate Department. The Chemical Department required various samples of latices and coagula of sundry clones and these were given. Some experiments in the manufacture of rubber were done in liason with this Department. The Mycology Department was supplied with staff and labourers from this Department for various sulphur-dusting and spraying experiments which were conducted by this Department. This Department's planting experiment at Hedigalla was attended to by the Estate Department.

1955 SUSPENSE ACCOUNT

1955 Replanting—5 Acres—Dartonfield:

Felling & Clearing.—This work has been completed.

1955 New Planting—78 Acres—Hedigalla:

Felling, Burning & Clearing.—This work is in progress. About 40 acres were completed by the end of this year.

Labour.—Labour was settled and sufficient for works done this year. More accommodation was provided in Hedigalla Division for additional labourers to meet the demands of increasing cultivated acreage. Wages were paid during the year in accordance with the Wages Boards Ordinance in force.

Dartonfield Group:

Working Ceylonese	*Resident*	*Non-Resident*	*Total*
Men ...	106	149	255
Women ...	78	113	191
Children ...	10	4	14
Working Non-Ceylonese			
Men ...	38	—	38
Women ...	29	1	30
Children ...	3	—	3
TOTAL ...	264	267	531

Annual Holidays.—Annual holidays with pay were given to all labourers who were entitled to them according to the Ordinance.

Maternity Benefits.—14 ordinary and 16 alternative payments were made to female labourers in accordance with the Ordinance.

Feeding Children.—Free rations and ¼ lb. of bread per diem were issued to each non-working child.

Health.—The health of the members of the Institute's staff and their families and of the estate labourers was fairly satisfactory during the year.

Infectious & Contagious Diseases.—No infectious or contagious diseases were detected on the Group during the year.

Spraying against Mosquitoes etc.—The surroundings of all bungalows and labourers cottages and lines were sprayed regularly with D.D.T. Gammexene under the supervison of the Apothecary.

Births.—9 children were born during the year on the Group.

Milk Foods.—Milk foods were issued to all children whose mothers were incapable of nursing them.

Deaths.—There were 2 deaths on the Group this year.

Hookworm Treatment.—Mass treatment of labourers on Dartonfield and Hedigalla Divisions was carried out by the staff of the Medical Officer of Health, Agalawatta. This was in addition to those cases treated by the Institute's Apothecary.

A list of the diseases treated by the Institute's Apothecary are given below:—

Influenza	...	765
Malaria	...	—
Ulcers	...	261
Anchylostomiasis	...	78
Other worms	...	242
Measles	...	—
Chicken Pox	...	—
Dysentry	...	—
Other diseases	...	1,859
	TOTAL	3,205

Dispensary Attendant.—The Apothecary was supplied with an orderly during this year to assist him.

MAINTENANCE OF BUILDINGS ETC. (REVENUE ACCOUNT)

General Buildings.—Repairs were effected to and walls were repainted where necessary in the Office and Laboratories.

Bungalows.—All Senior, Intermediate Staff and Assistant Staff bungalows were maintained in good order during the year.

Water & Power Supply.—Water and pipe lines and electric power plants and supply lines were maintained in good order throughout the year.

Bungalows Furniture.—Unserviceable rejected articles of furniture were replaced and repairs were effected where necessary.

Motor Vehicles.—The Station Wagon, Jeep, Commer lorry and Dodge Truck were properly maintained during the year. Four new International Trucks were received on loan from the Department of Agriculture towards the end of the year for use by the Smallholdings Department in its sulphur-dusting trials on smallholdings in the Kegalle District.

Machinery.—Messrs. H. W. Hammond & Co Consulting Engineers visited the Institute on 4th/5th March, 1954 and inspected all machinery, electrical fittings and power lines. Their report on this inspection was submitted to the Rubber Research Board. The recommendations made by the Engineer were attended to by the Senior Artisan and the Electrician during the year.

Power House (Dartonfield):

(*a*) **80/90 B.H.P. National Engine** worked satisfactorily during the year.

(*b*) 55 **KW 230 Volts D.C. Generator** driven by the above engine worked satisfactorily. Some minor defects were attended to by the Electrician.

(*c*) **40 B.H.P. Vertical Lister Engine** worked satisfactorily during the year.

(*d*) **24 KW 230 Volts D.C. Generator** direct coupled to the above engine worked satisfactorily.

(*e*) **240 B.H.P. Vertical Blackstone Engine** was installed by Messrs. Harrisons Lister (Engineering) Ltd. this year and worked satisfactorily.

(*f*) **160 KW 230 Volts D.C. Generator** direct coupled to the above enigne worked satisfactorily.

(*g*) **Main Switchboard** with the exception of one panel for the 55 KW generator, an entirely new Switchboard was installed for controlling the output from the 160 KW and 24 KW generator. All cable connections from these plants are in Pyrotenax.

(*h*) **Air Compressor.**—An additional air-compressor, together with a 1½ B.H.P. electric motor to work it was installed this year and is connected by air pipes to both the air bottles.

(*i*) **Starting Air Bottles.**—The Starting Air Bottles for the National Engine were tested by Messrs. Kenney & Co. and found to be in good order. The new Starting Air Bottle for the Blackstone was not due for testing this year.

(*j*) **Streamline Oil Filter.**—This filter, which is electrically operated, is in good order.

Factory Machinery:

(*a*) 26″×14″ **Water Cooled Grooved Mill** by Brown & Co. Ltd. driven by a 12½ B.H.P. electric motor. In good order.

(*b*) 26″×14″ **Water Cooled Grooved Mill** by Brown & Co., Ltd. driven by a 25 B.H.P. electric motor. In good order.

(*c*) **26″×14″ Water Cooled Spiral Grooved Mill** by Colombo Commercial Co., Ltd. driven by a 12 B.H.P. electric motor. In good order.

(*d*) **26″×14″ Water Cooled Smooth Mill** by Brown & Co., Ltd. driven by a 25 B.H.P. variable speed electric motor. In good order.

(*e*) **26″×14″ Water Cooled Smooth Mill** by Brown & Co., Ltd. driven by a 12½ B.H.P. electric motor. In good order.

(*f*) **26″×14″ Smooth Mill** by Brown & Co., Ltd. driven by a 12½ B.H.P. electric motor. In good order.

(*g*) **26″×14″ Grooved Mill** by Brown & Co., Ltd. driven by a 25 B.H.P. electric motor. In good order.

(*h*) **Large Scrap Washer** by Colombo Commercial Co., Ltd. driven by a 12½ B.H.P. electric motor. In good order.

(*i*) **"Guthrie" Cadet Sheeting Mill** driven by a 5 B.H.P. electric motor. In good order.

(*j*) **2×12″ Crepe Mills (1 Grooved & 1 Smooth)** driven by a 5 B.H.P. electric motor. In good order.

(*k*) **Sole Crepe Laminating Mill** driven by a 1½ B.H.P. electric motor. In good order.

Smoke House:

Direct fired Air Heater.—This plant, which consists of a heater No. 231 by Colombo Commercial Co., Ltd. together with Alcosa Blower and 4 B.H.P. electric motor, was installed this year by Messrs. Brown & Co., Ltd. This is in good order.

Gas Plant.—This functioned very satisfactorily and is in good order.

Battery House:

Battery of 200 cells of the N.I.F.E. In good order.

100 Volt Booster.—The commutator of the booster was scoured and had to be skimmed. It is now in good order.

Switchboard.—In good order.

Automatic Air Conditioning Plant: by Frigidaire.—In good order.

Workshop:

Electric Lathe (Portass).—This machine worked satisfactorily and proved to be a very useful acquisition.

Electric Grinding Mill by J. Hutton & Co.—This useful machine worked satisfactorily.

Electric Spray Painting Unit (Martindale).—This unit worked satisfactorily.

'Wolf' $1\frac{1}{4}$" Electric Drill complete with stand. In good order.

'Wolf' $\frac{1}{2}$" Electric Drill complete with stand. In good order

Circular Saw with electric motor.—In good order.

Water Pumping Plants Remote from Factory:

No. 1 Pump House.—One 4"×5" Double acting Horizontal pump by Myers, driven by a 5 B.H.P. electric motor. In good order.

No. 2 Pump House. One 4"×3" Horizontal Double acting Pump by Lee Howel, driven by a 5 B.H.P. electric motor. In good order.

No. 3. Pump House.—One 4"×5" Double Acting Horizontal pump by Myers, driven by a 5 B.H.P. electric motor. In good order. One 4"×5" Double Acting Horizontal pump by Myers, driven by a 5 B.H.P. electric motor. This standby unit is in good order, too.

No. 4. Pump House.—One Double Acting Horizontal pump by Walker and Greig Ltd. driven by a 2 B.H.P. electric motor. This pump and its driving motor were completely over hauled and are now in good working order. A portable pump too was bought this year for use in cleaning wells.

Electric Circuits.—All electric circuits were tested and any defects were repaired.

Machinery in Chemical Department Section of Factory:

(*a*) **D.R.C. Smooth Mill** fitted with 4"×2" diameter rolls, driven by a $\frac{3}{4}$ B.H.P. electric motor. In good order.

(*b*) **30" Hydro-Extractor,** driven by a 4 B.H.P. electric motor. In good order.

(*c*) **Steam Vulcanising Press** by Bradley Turton Ltd. In good order.

(*d*) **High Speed Disintegrator,** driven by a 3 B.H.P. electric motor. In good order.

(*e*) **Centrifugal Separator,** by De Lavel, driven by a $\frac{1}{2}$ B.H.P. electric motor. In good order.

(*f*) **Air Compressor** by William Allday & Son. In good order.

(*g*) **Baling Press.**—In good order.

(*h*) **Water Filter.**—In good order.

(*i*) **Ball Mill.**—driven by a 1 B.H.P. electric motor. Out of commission.

(*j*) **Small Ball Mill** by Griffin & Tatlock, driven by a $\frac{1}{4}$ B.H.P. electric motor. In good order.

(*k*) **Colloid Mill**—Driven by a $\frac{1}{2}$ B.H.P. electric motor. In good order.

(*l*) **Vacuum Drier and Steam Pump** by Emil Passburg. In good order.

(*m*) **Steam Vulcanising Press (Hand worked).**—In good order.

(*n*) **Stirrer.**—Driven by a 1 B.H.P. electric motor and manufactured by Kostner Evaporator Engineering & Co., Ltd. In good order.

(*o*) **6 N.H.P. Vertical Cross Tube Boiler etc.**—In good order.

Machinery in Laboratories:

All electrical machinery in the Laboratories were tested by the Visiting Engineer and all defects were attended to by the Institute's Electrician.

Nivitigalakele Division:

5 B.H.P. Vertical 4 stroke National Engine.—This engine received some necessary attention this year and will be completely overhauled when the required parts are received for replacements.

2½ KW 230 Volts D.C. Generator.—In good order.

Vertical Double Acting Pump.—In good order.

Smooth Hand Sheeting Mill (3½″ × 20″ rolls).—In good order.

Spiral Hand Sheeting Mill (4½″ × 24″ rolls).—In good order.

Lighting Installations in Bungalows.—The overhead main, the internal wiring and fittings were in good condition.

Hedigalla Division:

20 B.H.P. Gardner Oil Engine.—In good working order.

12 KW 230 D.C. Generator driven by the above engine. In good order.

24″ **Spiral Sheeting Mill,** driven by a 1½ B.H.P. electric motor. In good order.

Small Smooth Sheeting Mill by Colombo Commercial Co., Ltd. In good order.

Fuel Consumption of Power Plants:

		Average per hour
80/90 *B.H.P. National Engine*		
Liquid Fuel	...	2.11 gallons
Lubricating oil	...	0.22 ,,
40 *B.H.P. Lister Engine*		
Auto Diesel	...	1.36 gallons
Lubricating oil	...	0.12 ,,
240 *B.H.P. Blackstone Engine*		
Liquid Fuel	...	3.00 gallons
Lubricating oil	...	0.50 ,,
20 *B.H.P. Gardner Engine (Hedigalla)*		
Liquid Fuel	...	0.75 gallons
Lubricating oil	...	0.06 ,,
5 *B.H.P. National Engine (Nivitigalakele)*		
Liquid Fuel	...	0.75 gallons
Lubricating oil	...	0.08 ,,
C.C.C. Drier (Smoke House)		
Liquid Fuel	...	1.05 gallons
Lubricating oil	...	0.06 ,,

NEW BUILDINGS ETC.—CAPITAL ACCOUNT

Intermediate Staff Bungalow No. 2.—This bungalow was extended by the addition of a third bed room with bath room attached.

Intermediate Staff Bungalow No. 3.—This bungalow is nearing completion.

Assistant Staff Bungalow No. 17.—This bungalow was completed satisfactorily.

Water-sealed Latrines.—15 Double and 6 Single water-sealed latrines were built this year at Dartonfield and 3 Single-water-sealed latrines at Hedigalla.

Dispensary.—A new dispensary was built at Dartonfield as the old one was too small and inconveniently situated. The old dispensary is now the estate department tools room.

Firewood Shed for S.S. Bungalow No. 6.—This was built this year.

Bringing up to standard one Quadruple and two Double Cottages for Minor Staff Employees.—This work was not done in view of the R.R. Board's decision not to build additional quarters for Minor Staff at present.

Green House.—Corrugated Perspex sheets were fixed on the roof of the building.

Assistant Staff Bungalow, Nivitigalakele.—One bungalow was brought up to standard by extensions and improvements.

Double Cottages.—3 Double cottages suitable for minor staff and 3 Double cottages suitable for labourers were built this year at Hedigalla Division.

Assistant Staff Bungalow, Hedigalla.—Guttering and down-pipes were provided for all the bungalows.

Extra Well—Dartonfield.—An extra well was completed this year to augment the drinking water supply.

Factory Water Supply.—The dam of the reservoir was raised by another 5 feet this year to increase its water storage capacity. An additional pipe line was laid to the factory to meet the additional requirements of water.

Underground Electric Cable to Assistant Staff Bungalows.—This work is in hand and should be completed early next year.

Additional Power and Water supply to Hedigalla Bungalows etc.—This work, too, is in hand and should be completed early next year. The delay was due to the late arrival of the cable.

Additional Fluorescent Lights in Factory.—These were installed in the Chemical Section of the factory.

Experimental alterations and additions to Chemical Department Units.—were effected where necessary.

NEW ROADS—DARTONFIELD GROUP

Dartonfield Division.—A new road was built through the 1952 Replanted Area and another through the 1938 Replanted Area. The total extent of these roads was about ½ mile.

Hedigalla Division.—A new road is being constructed through the 1954 clearing. To date about 1½ miles have been completed.

RUBBER REHABILITATION

SUBSIDY SCHEME NURSERIES AT EGALOYA

These nurseries, which were opened up by the Institute in May, 1953 at the instance of the Rubber Replanting Advisory Board, continued to be looked after throughout 1954.

Superintendence.—The Estate Superintendent, R.R.I.C., paid supervisory visits weekly to the nurseries throughout the year.

Acreage.—The planted acreage of the nursery increased from 49 acres in 1953 to 65 acres in 1954.

Rainfall.—A rainfall of 184.97 inches was recorded during the year.

Planting Material.—The quantities of seedlings (TJ. 1) issued from the nurseries to distribution centres and individuals during the South-West and North-East Planting seasons of the year were as follows:—

Matugama (Nivitigalakele)	...	76,301
Ambalangoda	...	32,318
Alutgama	...	23,670
Elpitiya	...	14,543
Pitigala	...	8,525
Baddegama	...	32,557
Kalutara	...	29,435
Moragala	...	6,870
Akuressa	...	29,499
Kegalla	...	8,250
Warakapola	...	4,240
Dehiowita	...	1,000
Mawanella	...	2,240
Other (individuals)	...	3,523
TOTAL	...	272,971

Apart from these seedlings issued on instructions from the Rubber Controller, a further 2,479 yards of budwood and 10,972 budded stumps were issued from the nurseries.

It is expected that the nurseries will remain open for issue of appreciable quantities of planting material for South-West and North-East plantings during 1955.

Correspondence:

Inward	...	2,240 letters etc.
Outward	...	2,112 „ „

Estimates for 1955 for Capital and Revenue Expenditure on Dartonfield Group were prepared and submitted by the writer to the R.R. Board. These were accepted after certain amendments had been made to them.

REPORT OF THE SMALLHOLDINGS DEPARTMENT FOR THE YEAR 1954

By

W. I. Pieris

SUMMARY

In view of the importance of the Subsidy Replanting Scheme, special attention was given by the field staff to assisting smallholders who received permits under the Scheme, while the usual advisory services were continued to new-planting permit-holders and to other Rubber smallholders in general. Preliminary arrangements for a trial sulphur-dusting scheme of smallholdings in Kegalla in early 1955 were made. The market price of sheet rubber remained at Rs. 1/10.

The field staff of 43 officers remained on duty, while 6 extra temporary Rubber Instructors and one temporary clerk were appointed for Subsidy Replanting Scheme work. Loans for purchasing motor vehicles were given to one Assistant Propaganda officer, two District Field Officers and three Rubber Instructors. One Rubber Instructor left the Department. All new Rubber Instructors were trained in lining and other necessary field work.

The field staff paid 11,280 visits to 2,437 subsidy replanting permit areas (3,989½ acres) of the under-10-acre class, averaging about 4 visits per holding. These comprised the total permits issued to smallholders during 1954. Particulars of each holding and work done at each visit were recorded on specially prepared record sheets. Of this number, Instructors lined 1,845 holdings (2,914 acres) for holes and/or drains. 279 reports on replanting work were sent to the Rubber Controller. Subsidy Replanting work on smallholdings in general has been of a high standard during the year.

A leaflet on the application of R 4:6:5 manure for Rubber was issued in a form easily understood by smallholders.

All preliminary arrangements for commencing the Government Sponsored Trial Sulphur-Dusting Scheme for smallholdings in the Kegalla area during the 1955 wintering season (January-March) were made. A grant of Rs. 20,000/- was received from Government, but owners were requested to make a supplementary payment of Rs. 20/- and Rs. 30/- per acre for estates of under 10 acres and 10-50 acres respectively, which, with the Government grant, will cover the costs of the complete treatment of 5-6 weekly dustings, @ 12 lbs. of sulphur per acre per dusting. The work will be executed by the field staff of the Smallholdings Department. Necessary dusting machines, sulphur and transport were procured. 233 small estates comprising 535 acres applied to be dusted of which only 79 holdings covering 180 acres finally paid the charges due. These were divided into 3 groups to be dusted by 3 machines. The staff who will be engaged on the work was given special training at Nivitigalakele.

4,181 preliminary reports on the suitability of smallholdings for new-planting permits were made by Instructors. They paid 21,727 visits to new-planting areas for advice and lining. 1618 holdings comprising 1,781 acres were lined for holes and/or drains. 4,796 middle and peasant-class permits covering 7,979 acres were issued during year and 372 permits (630 acres) were cancelled.

105,270 clonal seedlings were issued free to peasant-class new-planters and 27,539 sold to middle-class new-planters from material available from Government nurseries. 10,066 budded stumps of PB. 86 and 465 of LCB. 870 were sold. 233 yards of budwood (mainly PB. 86) were issued free to peasants and 112 yards sold to middle-class new-planters. 738 yards of budwood were used for budding Departmental nurseries. 547 supervisory visits were paid to nurseries by Rubber Instructors. No provision is to be made in future for providing planting material to new-planting permit-holders as all supplies are required for subsidy replanters. 91 reports on illicit nurseries planted by smallholders were sent to the Rubber Controller.

Efforts were made to improve the quality of smallholders' sheet by sheet-making demonstrations and by explaining the unnecessary loss of anything up to 10 cents a pound by making low-grade sheet. 506 sheet demonstrations were given and 202 aluminium latex pans and 677 sq. ft. of mesh for strainers were sold. 252 visits were paid to 9 Smallholders' Latex Centres, which supplied 66,789 gallons of latex to the Katukurunda Latex Corporation.

37 demonstration and 41 private smokehouses of approved design were constructed by smallholders and 84 existing houses improved. 4,656 advisory visits were paid to smokehouse owners.

Rs. 12,720/90 was paid as soil conservation grants to 246 peasant class new-planting permit holders.

285 tapping, 91 disease control and 409 miscellaneous demonstrations were given to small owners.

The Department was required to vacate its office at the Fort and new accommodation was found at 33 Clifford Place, Colombo 4.

DETAILED REPORT

The Smallholdings Department devoted considerable attention during the year to small owners who received permits to replant their Rubber under the Government Subsidy Replanting Scheme, the success of which is likely to be of great economic benefit to the country. Assistance was also given in the form of advisory visits, lining and supplies of planting material to peasant and middle-class New Rubber Planting Scheme permit-holders, while the usual advisory services were continued to be rendered to Rubber smallholders in general. The market price of sheet rubber remained more or less static at Rs. 1/10 per pound, but went up to about Rs. 1/30 at the end of December. All preliminary arrangements for commencing the trial Sulphur Dusting Scheme in the Kegalla area early in 1955 were made during the latter part of the year.

Staff

The full staff of one Smallholdings Propaganda Officer, 3 Assistant Propaganda Officers, 4 District Field Officers, 29 Rubber Instructors, 4 Clerks and 2 Peons remained on duty during the year.

The following additional temporary staff was appointed in connection with the extra duties arising from the Subsidy Replanting Scheme:

Mr. P. R. Nonis	–R.I. Kamburupitiya	–appointed 1st April
Mr. W. D. Jayawardane	–R.I. Ruanwella	–appointed 1st May
Mr. V. Wijesinghe	–Additional R.I. Kegalla	–appointed 1st May
Mr. D. J. Ratnayake	–Addtional R.I. Ratnapura	–appointed 1st May
Mr. G. Weeratunga	–Additional R.I. Badegama	–appointed 1st May
Mr. P. D. Edirisinghe	–Additional R.I. Kalutara	–appointed 20th July
Mr. R. E. Perera	–Clerk	–appointed 8th March

The following officers were transferred:—

Mr. J. H. Suwaris from Warakapola to Talgaswela on 1st April

Mr. R. Gunadasa from Talgaswela to Warakapola on 1st April

Mr. W. M. D. Wijesundere from Migahatenna to Kuruwita on 1st pAril.

Mr. B. D. A. Gurusinghe from Kuruwita to Horana on 1st April.

Mr. W. D. Banda from Horana to Pelmadulla on 1st April.

Mr. R. G. Siripala from Pelmadulla to Matugama on 1st April.

Mr. K. P. Siriwardane from Matugama to Migahatenna on 1st April.

Mr. K. A. M. Perera from Kamburupitiya to Kalutara on 1st July and to Wadduwa as Additional R.I. on 1st September.

Mr. W. M. D. Wijesundera from Kuruwita to Pelmadulla on 1st September.

Mr. W. D. Banda from Pelmadulla to Kuruwita on 1st September.

Loans were given to the following for the purchase of motor vehicles:—

Mr. H. H. Peiris	...	A.P.O. (North)	...	Rs. 6,500/-
Mr. B. D. Pedrick	...	D.F.O. (R)	...	Rs. 7,500/-
Mr. D. R. Ranwala	...	D.F.O. (B)	...	Rs. 5,925/-
Mr. B. D. A. Gurusinghe	...	R.I. Horana	...	Rs. 1,900/-
Mr. W. M. D. Wijesundera	...	R.I. Kuruwita	...	Rs. 2,400/-
Mr. M. D. M. Gunawardane	...	R.I. Talangama	...	Rs. 1,500/-

Mr. S. D. Ruberoe, Rubber Instructor Ruanwella, left the Department at the end of May. All new Rubber Instructors were given a course of lectures and practical training in the use of the road-tracer etc. before being posted to their ranges.

Subsidy Replanting

Considerable attention was focussed by the field staff in assisting smallholders to replant their lands in accordance with the requirements of the Subsidy Replanting Scheme. The Rubber Controller issued the following replanting permits in respect of the year 1954:—

	Permits	*Acres*	*Roods*	*Perches*
Estates over 100 acres	369	9,271	1	04
Estates of 10 to 100 acres	1,049	5,771	0	02
Smallholdings under 10 acres	2,437	3,989	2	13
	3,855	19,031	3	19

Every one of the above 2,437 smallholdings was visited by a Rubber Instructor. A total of 11,280 visits were paid to them during the year, averaging over 4 visits per holding. The condition in which they were found at each visit and the work done or recommended was recorded in a special record-sheet which is maintained for each holding, so that a comprehensive picture of their progress is readily available. Instructors lined 1,845 of these holdings comprising 2,914 acres for holes and/or drains and 279 reports were sent to the Rubber Controller on various matters connected with replanting

permit-areas. The advice and practical assistance given to permit-holders by the field staff in carrying out the recommendations of the advisory leaflet on replanting have resulted in a high general standard of work on most replanted smallholdings, which compare favourably with the standard on large estate. The Rubber Controller, who is the Officer-in-Charge of the Subsidy Replanting Scheme, in a letter to the writer dated 4th August, 1954 writes: 'On my visits to District P.As., several planters who are Visiting Agents under the Rubber Replanting Subsidy Scheme have spoken highly of the standard of replanting on small-holdings replanted under the Scheme. A very large share of the credit for the splendid work that is being done in the smallholdings belongs to you and your staff. I am most grateful to you for the assistance you are giving me in this matter'.

The field staff supervised replanting operations in the Government Rubber Allotments at Urumiwela, Tunbage and Arampola.

A leaflet was prepared with diagrams showing the dose and method of application of R 4:6:5 manure to Rubber plants according to age. Owners were advised to manure their replanted holdings in this way in order to secure the required girth for obtaining the grants.

Sulphur Dusting

The increasing demand from small estate owners for Government assistance in sulphur-dusting their Rubber trees against the continued annual ravages of Oidium caused the Government to give a grant of Rs. 20,000/- to this Department for carrying out a traial Sulphur-Dusting Scheme in the Kegalla district during the 1955 wintering season (January-March, 1955). All preliminary arrangements were, therefore, made. A memorandum was prepared outlining the probable costs of the scheme which, in execution, would be somewhat more difficult and costly than usual due to the fact that the holdings to be dusted will not be together and the dusting machine will have to be transported to a number of scattered areas each day. A leaflet explaining the scheme and its cost was issued to small owners through Rubber Instructors and applications were invited. Owners were requested to pay Rs. 20/- per acre for holdings of under 10 acres and Rs. 30/- per acre for small estates of 10-50 acres for the complete treatment of 5 or 6 dustings at weekly intervals, at 12 lbs. of sulphur per acre per dusting. This charge is to cover part expenses of the scheme and on its payment the complete treatment will be carried out by the field staff of this department with its own dusting machines, transport, sulphur and labour. One Noidium Machine was purchased, and one Mistral IIA and one BSE Matador Machine were supplied on loan, for trial and report on their suitability for the work, by kind courtesy of Messrs. A Baur & Co. Ltd. and Chatham House Ltd. respectively.

233 applications comprising 535 acres were received, of which only 130 holdings covering 318 acres could be accepted for dusting owing to remoteness of situation etc. Of this number nearly 50 per cent. did not remit the payment due and 79 holdings covering 180 acres eventually remained for dusting. These areas will be divided into 3 groups according to situation and each group dusted by one of the 3 machines. Each machine will operate in its group on 5 days of the week under a Rubber Instructor whose work will be supervised by a District Field Officer, and the 6th day will be set apart for catching up any arrears caused by rain etc. 3 Vans for transporting the dusting machines were loaned by the Department of Agriculture and necessary supplies of sulphur were bought.

Rubber Instructors, District Field Officers and Assistant Propaganda Officers, who will be in charge of dusting were given special instruction at Nivitigalakele.

The object of the scheme is to ascertain the beneficial effects of sulphur-dusting, the actual costs of dusting under smallholdings conditions and to explore the possibilities of expanding the work to cover wider areas in future years. It is expected to begin dusting about the middle of January, 1955.

New Planting

Next to replanting, Rubber Instructors devoted most time to visiting and advising new-planting permit-holders. Each new area was visited and reported on by a Rubber Instructor before a permit was issued by the Rubber Controller and a total of 4,181 such reports was sent. 4,796 middle-class and peasant-class permits covering 7,979 acres were issued during the year and 372 permits comprising 630 acres were cancelled. 21,727 visits to new-planting areas were made by the field staff for advice and lining. With the issue of fresh permits each year, the quantity of new-planting areas with which the staff has to maintain contact has become very large and a considerable proportion of its time is taken up by this work. Instructors lined 1,618 new-planting holdings comprising 1,781 acres for holes and/or soil conservation.

Planting Material

Although on instructions received, no new nurseries were planted in 1953 for supplying planting material to smallholders in 1954, considerable supplies were issued during the year, mainly to new-planting permit-holders, from surplus material available from Government nurseries which were established for Replanting Scheme requirements. After October, however, no clonal seedlings could be issued as all supplies were needed for replanters. Advice was also received from the Minister that no material could be spared for new-planters during 1955 and that permit-holders should arrange to procure their requirements from approved private nurseries or take steps to plant their own nurseries.

The following material was issued:—

(*a*) 132,809 clonal seedlings, consisting of 105, 270 free issues to peasant-class new-planters and 27,539 sales to middle-class new-planters, were supplied from Government nurseries at Walpita, Horana, Eraminigolla, Labuduwa, Karapincha and Halugama.

(*b*) 10,666 budded stumps of PB. 86 and 465 budded stumps of LCB. 870 were issued from Smallholdings Department nurseries at Nivitigalakele, Egaloya, Karapincha and Eraminigolla.

(*c*) 233 yards of budwood were issued free to peasants and 112 yards sold to the middle-class from Eraminigolla Government nursery.

738 yards of budwood were also used for budding Departmental nurseries at Karapincha, Nivitigalakele and Eraminigolla, the budwood used being mainly PB. 86. 547 visits to nurseries were paid by the field staff.

The question of continuing to provide suitable planting material to new-planting smallholders merits careful consideration as there is likely to be danger in the policy of allowing them to find their own material Moreover the purpose of the New Rubber Planting Scheme would not be fulfilled unless it could be ensured that proved high-yielding material was planted on every permit-areas. It is also essential that the Rubber Controller should allow new-planting permits only after being fully satisfied as to the genuineness of the material that is to be planted.

91 reports were sent to the Rubber Controller on nurseries planted by smallholders without a permit.

Sheet Improvement

The smaller the margin of profit between market price and cost of production the greater is the need for smallholders to improve their sheet. The average smallholder also loses considerable income by making low-grade sheet, because the current market rate for grade 4 is about 10 cents below that for grade 1. These facts were brought home to smallholders by Rubber Instructors in the course of demonstrations etc. and an effort made to improve the quality of sheet. 506 sheet-making demonstrations were given. 202 aluminium latex pans and 677 sq. ft of mesh for strainers were sold. 330 samples of coagulating acid were tested. As a result of these efforts there was a definite improvement in sheet in at least 141 smallholdings.

26 demonstration and 54 private smokehouses of approved design were started and 37 demonstration (including some started the previous year) and 41 private ones were completed. 84 existing houses were improved by the introduction of ventilation and improved design. Instructors paid 4,656 visits to smokehouses for advisory purposes.

Rubber Instructors visited and supervised work in the Co-operative Sheet Making Societies at Hataraliyadda, Kahagalla, Arampola, Henepola, Ittapana and Molkawa, which functioned satisfactorily and resulted in financial benefit to their members.

Latex Centres

252 supervisory visits were made by Instructors to 9 Latex Centres, which supplied 66,789 gallons of rubber latex to the Latex Corporation at Katukurunda.

Soil Conservation

Rs. 12,720/90 was paid out as soil conservation grants to 246 peasant-class new-planting permit-holders. All work was measured by Rubber Instructors and counter-checked by District Field Officers before payment. (Lining for soil conservation done by Instructors is mentioned under 'Subsidy Replanting' and 'New Planting'.

Demonstrations

Besides sheet demonstrations, 285 tapping, 91 disease-control and 409 miscellaneous demonstrations were given by Rubber Instructors.

Correspondence

General	...	Inward 4,141
	...	Outward 6,982
With Rubber Controller	...	Inward 4,598
	...	Outward 7,927 (*including* 6,844 *preliminary reports*).

General

The Department was requested to vacate its present office in the Rubber Controller's Office, Fort, as it was needed for the Milk Board. New accommodation at Rs. 300/- per mensum was found at 33 Clifford Place, Bambalapitiya. The office will shift to its new location in January, 1955.

At a Meeting of the Smallholdings Committee on August 11th it was decided not to shift the Smallholdings Office from Colombo for the present.

The Sinhalese leaflet giving instructions on producing clean sheet was revised and 5,000 copies printed. 1,000 copies were supplied to the Rubber Commissioner by request.

AUDITOR GENERAL'S REPORT FOR 1953

No. M-2(4)8,
Audit Office,
Colombo 7, 17th November, 1954.

The Chairman,
Board of Management,
Rubber Research Institute,
Agalawatta.

The accounts of the Rubber Research Institute, Agalawatta (Ceylon) for the year ended 31st December, 1953 were audited under my direction.

The Financial Statements, *viz:*—

(*a*) Capital Account, Revenue Account and General Balance Sheet,

(*b*) Dartonfield Group Working Account, and

(*c*) Provident Fund Working Account.

were compared with the books and accounts and found to agree. The Balance Sheet has been duly certified and is returned herewith. The following are the comments which I consider it necessary to offer on these accounts.

I. Revenue Account

2. **Income.**—The actual income for the year amounting to Rs. 1,546,937.66 was more than the estimated income of Rs. 1,312,950/- by Rs. 233,987/66 and was less than the actual income for the previous year by Rs. 35, 287/37. A comparative statement showing the estimated and actual income is annexed—marked A. The reasons for the variations are indicated in that statement.

3. **Dartonfield Group.**—The working account of the Dartonfield Group shows a profit of Rs. 58,063/39 which is less than the profit of Rs. 78,166/34 for the previous year; it however, exceeded the estimated profit of Rs. 21,250/-. The reduction in profits in 1953 is due mainly to the reduction in prices of the manufactured rubber. The average sale price fell from Rs. 1/32 in 1952 to -/85 cts. in 1953 for manufactured rubber and from Rs. 1/60 in 1952 to Rs. 1/42 in 1953 for creamed latex. The Dartonfield Working Account shows that expenditure on harvesting food crops etc., exceeded the amount realised from sales by Rs. 1,200/84 which was stated to be due to the fact that the full crop was not harvested till the end of 1953. A test check of the check rolls during the recent Audit Inspection of the estate office of Dartonfield Group revealed a number of cases of erroneous payments of wages to labourers. These have been brought to the notice of the Superintendent. The introduction of an effective internal check seems desirable to avoid such errors.

4. **Interest on Investments.**—The interest on investments for the year amounted to Rs. 92,332/29 as compared with Rs. 83,616/75 for the previous year. This sum fell short of the estimate by Rs. 3,667/71. The shortfall is due partly to over estimate and partly to the realisation at maturity in June, 1953 of a sum of Rs. 30,000/- invested in $3\frac{1}{4}$ per cent. Home Defence Loan.

II. Expenditure

5. **Revenue Expenditure.**—The total expenditure on revenue account exclusive of amount provided for depreciation of fixed assests (Rs. 61,314/55) and audit fees (Rs. 1,600/-) amounted to Rs. 987,148/30 as compared with Rs. 920,244/38 for the previous year. The details of the revenue expenditure are set forth in the Revenue Account.

6. **Capital Expenditure.**—The net addition to Capital amounted to Rs. 795,478/21 as compared with Rs. 589,617/69 for the previous year.

7. **Estimated and Actual Expenditure.** The statement showing the approved estimates of expenditure as compared with the actual expenditure is attached—marked 'B'. The reasons for the variations as furnished by the Director are given against each item. Under Revenue Expenditure, there has been excess expenditure on 10 items aggregating Rs. 26,987/89 and under Capital Expenditure there was total excess of Rs. 21,594/09 on 12 items.

The covering approval of the Board will have to be obtained for the excess expenditure.

III. Capital Account

8. **London Plant—Rs. 11,333/34.**—This figure represents the book value of the Plant held by the London Advisory Committee for Rubber Research Work on behalf of Ceylon & Malaya. No report was received to show that this plant was still owned and used by the London Committee. It is suggested that in future a certificate be obtained at the close of each year from the London Committee in regard to the ownership of the plant and its condition.

IV. Balance Sheet

9. **Depreciation Reserve A/c. Rs. 418,649/36.**—A sum of Rs. 61,314/55 was provided for depreciation of fixed assests, while a sum of Rs. 7,092/18, being the amount reserved for depreciation on the 3 V.Q. Ruston Engine sold in 1953 was transferred from the depreciation reserve to the surplus account. The reserve accordingly increased by a nett sum of Rs. 54,222/37, and stood at Rs. 418,649/36 on 31-12-53.

10. **Medical Fund Reserve—Rs. 26,816/67.**—The balance to the credit of the fund on 31-12-52 was Rs. 21,415/78. A sum of Rs. 12,322/28 which included Rs. 406/77 being recovery on account of the loans granted to two officers during the year, was added to the fund. The payments including loans granted to two officers amounted to Rs. 6,921/39, leaving a balance of Rs. 26,816/67 to the credit of the fund at the end of the year.

11. **Payments in Advance—Rs. 46,776/75.**—Included under this head is a sum of Rs. 29,509/49 spent on establishment and upkeep of nurseries. A sum of Rs. 29,400/- had been provided in the estimates under capital expenditure for this purpose and although this expenditure was shown in the 1953 monthly accounts under this heading, the expenditure has been shown in the Balance Sheet under the item 'Payments in Advance'.

12. **Stock.**—Rs. 43,633/20 comprises the following as certified by the Superintendent:—

Materials	...	Rs. 42,467.84
Food Stuffs	...	„ 1,165.36
		Rs. 43,633.20

and represent stock in hand on 31-12-53. These have been valued at cost price.

13. **Depreciation on Investments—Rs. 366,035/-.**—The investments which showed an appreciation of Rs. 26,646/87 as at the end of the previous year depreciated in value during the year as shown below:—

Total face value of investment	...	Rs. 2,983,150.00
Market value of investment	...	„ 2,617,115.00
		Rs. 366,035.00

The Board might consider the desirability of adopting the practice followed by Government in regard to investments, *i.e.* to show them in the books and the Balance Sheet at cost price and to indicate their middle market value by a foot-note in the Balance Sheet.

14. **Outcome of Accounts.**—There was a surplus of Rs. 1,683,813/65 at the beginning of the year and the excess of income over expenditure for the year amounted to Rs. 496,874/81 which increased the surplus to Rs. 2,180,688/46. After appropriating a sum of Rs. 795,478/21 for capital expenditure and adding a sum of Rs. 11,842/18 being value of assets sold a balance of Rs. 1,397,052/43 was carried forward to the year 1954.

Reserves provided for the stabilisation of income amounted to Rs. 1,000,000/00 and for depreciation on fixed assets to Rs. 418,649/36.

15. **Value of Asset Sold—Rs. 11,842/18.**—This represents the proceeds of sale of the 3 V.Q. Ruston Engine amounting to Rs. 5,250/- less Rs. 500/- received during the previous year as part purchase consideration, plus the amount of Rs. 7,092/18 provided by way of depreciation in the depreciation reserve and now transferred to Surplus on sale of asset. Under the accounting procedure in vogue the sum of Rs. 5,250/- though a Capital receipt is accounted for as a credit to the Surplus Account as all Capital Expenditure is met from revenue surpluses.

16. **Board of Survey Report for 1953.**—The report of the annual Board of Survey for 1953 was furnished only on 27-9-54 and is under examination.

Sgd. D. S. DE SILVA,
for Auditor General.

RUBBER RESEARCH INSTITUTE OF CEYLON.

Dr. **REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953.** **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
To Personal Emoluments:—					
Senior Scientific Staff	137,476.61		By Cess Collections		1,193,824.94
Junior Scientific Staff	31,493.39		,, Government Grant for Smallholdings Work		194,168.00
Office Staff ...	38,387.51	207,357.51	,, Profit from Dartonfield Group		58,063.39
			,, Interest ...		92,332.29
To Library and Publications:—			,, Sale of Publications		2,222.71
Library	7,791.95		,, Sundry Receipts		6,326.33
Publications	7,738.02	15,529.97			
To Smallholdings Work:—					
Salaries and Allowances	205,591.78				
Travelling and General Expenses	53,928.14	259,519.92			
To Laboratory:—					
Equipment and Working Expenses	20,974.90				
Furniture Replacements	360.66	21,335.56			
To Field and Factory Experiments:—					
Field Experiments	26,928.76				
Factory Experiments	9,384.80	36,313.56			
To Office:—					
Stationery and Office Equipment	4,510.05				
Postage and Telegrams	3,331.97				
Advertising	1,456.94				
Telephones	1,797.65				
Audit	1,600.00	12,696.61			
To Travelling:—					
Expenses of Board Members	2,134.86				
Expenses of Staff	23,914.51	26,049.37			
Carried Over		578,802.50	Carried Over		1,546,937.66

Dr. REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953—(*Contd.*) Cr.

	Rs. Cts.	Rs. Cts.
Brought Forward		578,802.50
To Maintenance of Buildings, Power and Water Supply and Motor Vehicles:—		
General Buildings	1,889.31	
Bungalows	5,561.80	
Power and Water Supply	6,831.21	
Bungalow Furniture Replacements	1,621.27	
Motor Vehicles	4,886.76	20,790.35
To Miscellaneous Items Shared With Estates:—		
Dartonfield Group General Charges	96,830.57	
Upkeep of Roads and Grounds	1,412.57	
Upkeep of Bungalow Premises	7,504.80	
Factory Upkeep	2,827.90	
Power Supply	13,299.86	121,875.70
To Other Charges:—		
Contribution to L.A.C.	30,666.67	
Contribution to B.R.P.R.A.	30,000.00	
Contingencies	3,477.27	
Insurance	6,971.67	
Staff Provident Fund	73,304.28	
Passages	15,000.00	
Entertainment Allowance	228.00	
Dearness Allowance to Staff	93,752.29	
Assistant Staff Medical Fund	5,800.62	
Social Services	1,691.32	
Senior Staff Medical Scheme	2,125.11	
Entertainment of Board Members	83.60	
Fire Extinguishers	1,074.75	
Rubber Conference	3,104.17	
Depreciation	61,314.55	328,594.30
Balance, being excess of Income over Expenditure for the year, carried forward to Balance Sheet		496,874.81
	Rs.	1,546,937.66

	Rs. Cts.	Rs. Cts.
Brought Forward		1,546,937.66
	Rs.	1,546,937.66

RUBBER RESEARCH INSTITUTE OF CEYLON.

CAPITAL ACCOUNT AS AT 31st DECEMBER, 1953.

EXPENDITURE

	To December 31st 1952 Rs.	Transfers between A/cs. Rs.	Additions in 1953 Rs.	Total Rs.
To Land Including Development:—				
Dartonfield	221,631.66		36,827.06	258,458.72
Nivitigalakele	174,156.91		5,700.80	179,857.71
Hedigalla	303,506.90		180,418.52	483,925.42
To Buildings and Lines				
Dartonfield:—				
Estate	210,730.97		1,644.11	212,375.08
Headquarters	437,788.29		163,308.27	601,096.56
Nivitigalakele:—				
Estate	45,945.21		369.89	46,315.10
Headquarters	21,993.03		150.00	22,143.03
Hedigalla:—				
Estate	148,098.53		57,372.19	205,470.72
Headquarters	18,628.62		—	18,628.62
To Furniture and Fixed Equipment:—				
Dartonfield	109,944.02		22,983.46	132,927.48
Nivitigalakele	5,733.70		—	5,733.70
Hedigalla	1,764.25		671.96	2,436.21
To Power and Water Supply:—				
Dartonfield	127,720.26		16,337.22	144,057.48
Nivitigalakele	7,863.70		15.00	7,878.70
Hedigalla	6,050.24		5,432.16	11,482.40
To Machinery and Tools:—				
Dartonfield	269,820.84	Cr.18,400.00	268,141.93	519,562.77
Nivitigalakele	4,754.23		—	4,754.23
Hedigalla	2,711.06	9,000.00	5,817.64	17,528.70
To Laboratory Apparatus	92,206.00		30,288.00	122,494.00
To London Plant	11,333.34		—	11,333.34
Rs.	2,222,381.76	9,000.00	795,478.21	3,008,459.97

RECEIPTS

	Rs. Cts.	Rs. Cts.
By Revenue applied for capital purposes:—		
At 31st December, 1952	2,222,381.76	
Less Disposals	9,400.00	
	2,212,981.76	
In 1953	795,478.21	3,008,459.97
Rs.		3,008,459.97

RUBBER RESEARCH INSTITUTE OF CEYLON.

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1953.

LIABILITIES

	Rs. Cts.	Rs. Cts.
CREDITORS:—		
Sundries	87,508.37	
Receipts in Advance	247,450.72	334,959.09
PASSAGE FUND RESERVE:—		
At December 31, 1952	24,654.28	
Add Reserve for 1953	15,000.00	
	39,654.28	
Less Payments in 1953	8,529.01	31,125.27
DEPRECIATION RESERVE:—		
At December 31, 1952	364,426.99	
Add Reserve for 1953	54,222.37	418,649.36
PROVIDENT FUND RESERVE:—		
At December 31, 1952	365,570.35	
Additions during 1953	125,879.01	
	419,449.36	
Less Payments in 1953	15,775.71	475,673.65
MEDICAL FUND:—		
At December 31, 1952	21,415.78	
Additions during 1953	12,322.28	
	33,738.06	
Less Payments in 1953	6,921.39	26,816.67
AUDIT FEE RESERVE:—		
At December 31, 1952	2,148.43	
Add Reserve for 1953	1,600.00	
	3,748.43	
Less Payments	—	3,748.43
Carried Over		1,290,972.47

ASSETS

	Rs. Cts.	Rs. Cts.
DEBTORS:—		
Cess Collection for December, 1953	66,954.73	
Sundries	60,906.13	127,860.86
ADVANCE ACCOUNTS:—		
ESTATE SUPERINTENDENT		
Dartonfield Group	18,403.32	
Egaloya Rubber Nursery	24.03	
SMALLHOLDINGS PROPAGANDA OFFICER		
General Account	2,665.65	
Soil Conservation Account	423.74	
LONDON ADVISORY COMMITTEE	22,420.97	
POSTMASTER GENERAL	160.00	44,097.71
ACCRUED INTEREST ON INVESTMENTS:—		24,981.56
PAYMENTS IN ADVANCE:—		46,776.75
STOCK:—		
Estate Stocks		43,633.20
LOANS TO OFFICERS:—		29,834.06
Loan to R.R.I.C., Co-operative Store		2,770.77

INVESTMENTS:—	Face Value	Middle Market value at 31-12-53
	Rs. Cts.	Rs. Cts.
In Ceylon Government 3½% Loan 1957/62	25,000.00	24,531.25
In Ceylon Government 3 % Loan 1956/60	20,000.00	19,625.00
Carried Over	45,000.00	364,111.16

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1953.(*Contd.*)

LIABILITIES	Rs. Cts.	Rs. Cts.
Brought Forward		1,290,972.47
RESERVE FOR STABILISATION OF INCOME:—		
At December 31, 1952	1,000,000.00	
Additions in 1953	—	1,000,000.00
SURPLUS ACCOUNT:—		
At December 31, 1952	1,683,813.65	
Add Excess of Income over Expenditure for 1953	496,874.81	
	2,180,688.46	
Add Value of Asset sold	11,842.18	
	2,192,530.64	
Less Contribution to Capital Outlay	795,478.21	1,397,052.43
	Rs.	3,688,024.90

ASSETS	Rs. Cts. Face Value	Rs. Cts. Middle Market Value at 31-12-53.
INVESTMENTS:—(*Contd.*)		
Brought Forward	45,000.00	364,111.16
In Ceylon Government 3½% National Loan 1964/69	70,000.00	66,850.00
In Ceylon Government 3¼% National Loan 1956	100,000.00	101,962.50
In Ceylon Government 3% National Loan 1954	5,000.00	5,075.00
In Ceylon Government 3% Defence Loan 1954	15,000.00	15,000.00
In Ceylon Government 3% Sri Lanka Loan 1969/74	750,000.00	644,062.50
In Ceylon Government 3% Government Loan 1966/71	500,000.00	433,750.00
In Ceylon Government 3% Government Loan 1972/77	500,000.00	414,812.50
In Ceylon Government 3% Loan 1973/78	600,000.00	503,250.00
Ceylon State Mortgage Bank 3¼% Debentures	398,150.00	388,196.25
	2,983,150.00	
Depreciation on Investments		366,035.00
CASH BALANCES:—		
At Ceylon Savings Bank		4,241.40
On Savings Deposit (Bank of Ceylon)		9,348.68
In Current Account		369,809.69
In Hand		1,520.22
	Rs.	3,688,024.90

The Accounts of the Rubber Research Institute for the year ended December 31, 1953, have been audited under my direction. Subject to the observations in the accompanying report, as a result of this audit, I am of opinion that the Balance Sheet and Financial Statements above set forth have been drawn up in accordance with the Books and Records maintained by the Institute, so as to present fairly the financial position of the Institute as at December 31, 1953 and the results of its operations for the year ended on that date.

Audit Office,
Colombo 7, 17th November, 1954.

(Sgd.) D. S. DE SILVA,
for Auditor-General.

DARTONFIELD GROUP

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953.** **Cr.**

	Rs. Cts.	Rs. Cts.		Rs. Cts.	Rs. Cts.
To Expenditure:—			By Sale of Produce:—		
General Charges	31,579.16		Manufactured Rubber (75,689 lbs.)	64,221.94	
Upkeep, Manufacture and Distribution	80,822.45	112,401.61	Creamed Latex (62,005 lbs.)	88,312.96	152,534.90
,, Harvesting of Food Crops	2,070.04		,, Sale of Planting Material etc.		20,337.32
Less Sales	869.20	1,200.84			
,, Handling and Distribution of Planting Material		1,206.38			
,, Balance being excess of Income over Expenditure transferred to Revenue Account		58,063.39			
	Rs.	172,872.22		Rs.	172,872.22

PROVIDENT FUND.

Dr. **WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953.** **Cr.**

	Rs. Cts.		Rs. Cts.
To Payment to 11 retiring officers	15,775.71	By Balance brought forward from 1952	365,570.35
,, Balance carried forward to 1954	475,673.65	,, Board's Bonus for 1953	55,318.19
		,, Interest on officers' contributions	7,685.35
		,, Interest on Board's Bonus Account	9,211.75
		,, Bonus paid to 3 retiring officers	1,342.44
		,, Interest for 1953 paid to 8 retiring officers	293.08
		,, Members' Contributions during 1953	52,028.20
Rs.	491,449.36	Rs.	491,449.36

ESTIMATES AND ACTUAL INCOME STATEMENT FOR 1953. A

	Estimate Rs. Cts.	Actual Income Rs. Cts.	Excess Rs. Cts.	Deficit Rs. Cts.	
Cess Collections	985,600.00	1,193,824.94	208,224 94	—	Larger exports of rubber
Interest	96,000.00	92,332.29	—	3,667.71	Maturity of an investment and over estimate
Sale of Publications	1,500.00	2,222.71	722.71	—	More publications sold
Profit from Dartonfield Group	21,250.00	58,063.39	36,813.39	—	More creamed latex sold than anticipated
Sundry Receipts	2,000.00	6,326.33	4,326.33	—	Replanting subsidy not estimated
Government Grant for Smallholdings Work	206,600.00	194,168.00	—	12,432.00	Curtailment of grant

STATEMENT OF EXCESSES AND SAVINGS ON VOTES 1953

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
1.	Administration of the Board:— Travelling Expenses of Board Members	4,000.00		2,134.86		1,865.14	Over estimate
2.	Emoluments of Senior Scientific Staff:—	140,650.00		137,476.61		3,173.39	Non employment of 1 Research Assistant
3.	Emolument of Junior Scientific Staff:—	36,397.00		31,493.39		4,903.61	Non employment of full staff
4.	Library & Publications:— A. Library	6,000.00		7,791.95	1,791.95		More publications purchased
	B. Publications	6,500.00		7,738.02	1,238.02		More publications issued
5.	Smallholdings Work:— A-F & H. Emoluments of Staff	232,584.00		205,591.78		26,992.22	Non employment of full staff
	G & I-J. Travelling and General Expenses	99,980.00		53,928.14		46,051.86	Non employment of full staff and more credits received by sale of planting material
6.	Laboratory:— A. Equipment and Working Expenses	37,000.00	2,984.84	20,974.90		13,040.26	Payments not complete
	B. Furniture Replacements	600.00		360.66		239.34	Over estimate.
7.	Field and Factory Experiments:— A. Field Experiments	19,400.00		26,928.76	7,528.76		More experiments undertaken.
	B. Factory Experiments	20,000.00		9,384.80		10,615.20	Full experiments not undertaken. in 1953

STATEMENT OF EXCESS AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
8.	Office:—						
	A-C Emoluments of Office Staff	38,816.00		38,387.51		428.49	Changes in Staff.
	D. Stationery and Office Equipment	5,000.00		4,510.05		489.95	Economies.
	E. Postages & Telegrams	3,500.00		3,331.97		168.03	Economies.
	F. Advertising	1,000.00		1,456.94	456.94		More Vacancies advertised.
	G. Telephone	2,000.00		1,797.65		202.35	Changes in installation of new telephone lines.
	H. Audit	1,600.00		1,600.00			
9.	Travelling Expenses of Staff:—	20,000.00		23,914.51	3,914.51		More travelling done on Oidium work.
10.	Maintenance of Buildings & etc:—						
	A. General Buildings	2,000.00		1,889.31		110.69	Economies.
	B. Bungalows	5,800.00		5,561.80		238.20	Economies.
	C. Water & Power Supply	6,000.00		6,831.21	831.21		Unexpected repairs to power lines.
	D. Bungalow Furniture Replacements	2,000.00		1,621.27		378.73	Over estimate.
	E. Motor Vehicles	8,500.00		4,886.76		3,613.24	More credits realised by use of vehicles.
11.	Miscellaneous Items Shared with Estate:—						
	A. Dartonfield Group General Charges	90,371.00		96,830.57	6,459.57		Under estimate on D. A. etc.
	B. Upkeep of Roads and Grounds	1,875.00		1,412.57		462.43	Economies.
	C. Upkeep of Bungalow Premises	5,000.00		7,504.80	2,504.80		Under estimate.
	D. Factory Upkeep	6,210.00		2,827.90		3,382.10	Normal maintenance and repair work not carried out owing to factory extension work.
	E. Power Supply	12,083 00		13,299.86	1,216.86		Increased fuel consumption.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
12.	Other Charges:—						
	A. Contribution to London Advisory Committee	31,000.00		30,666.67		333.33	Difference in rate of Exchange.
	B. Contingencies	2,432.00		3,477.27	1,045.27		Unexpected expenses in respect of V.A.'s and Lawyers' fees.
	C. Insurance Charges	9,000.00		6,971.67		2,028.33	Due to full building programme not being completed.
	D. Staff Provident Fund	76,300.00		73,304.28		2,995.72	Non employment of full staff.
	E. Passages	15,000.00		15,000.00			
	F. Entertainment Allowance	500.00		228.00		272.00	Over estimate.
	G. Dearness Allowance to Staff	97,164.00		93,752.29		3,411.71	Non employment of full Staff.
	H. Assistant Staff Medical Fund	6,750.00		5,800.62		949.38	Non employment of full staff.
	I. Social Services	2,000.00		1,691.32		308.68	Economies.
	J. Senior Staff Medical Scheme	2,500.00		2,125.11		374.89	Less claims.
	K. Contributions to B.R.P.R.A.	30,000.00		30,000.00			
	L. Entertainment of Board Mbs.	250.00		83.60		166.40	Over estimate.
	M. Fire extinguishers	1,125.00		1,074.75		50.25	Discount received.
	N. Rubber Conference	4,000.00		3,104.17		895.83	Over estimate.
13.	Depreciation:—	63,000.00		61,314.55		1,685.45	Due to full building programme not being completed.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—(*Contd.*)

Head of Estimate	Account	Estimate	EXPENDITURE Capital	Revenue	Excess	Savings	Remarks
14.	CAPITAL ACCOUNT:—						
	A. Upkeep of Dartonfield Group Immature Areas	81,437.00	87,617.26		6,180.26		More weeding done in all areas.
	B. Replanting 14 acres Dartonfield	6,973.00	9,764.47		2,791.47		More Fomes work and underestimate.
	C. Replanting 7 acres Nivitigalakele	4,027.00	4,500.99		473.99		More soil conservation work.
	D. Planting 111 acres Hedigalla	68,913.00	75,553.17		6,640.17		Additional 5 acres charged owing to presence of large slab rock in jungle area originally select.
	E. Community Centres at Dartonfield and Hedigalla	15,000.00	13,255.43			1,744.57*	Equipment not complete.
	F. Additional Quarters for S.S. B'low Servants	4,500.00	3,305.23			1,194.77*	Work not completed.
	G. Extensions to Administrative and Botanical Blocks	77,200.00	47,042.87			30,157.13*	Work not completed.
	H. Constant temperature room for Chemist (including plant)	9,000.00	7,968.24			1,031.76*	Work not completed.
	I. Six Double Cottages and Latrines at Hedigalla	39,000.00	39,857.06		857.06		Water Supply not estimated. for.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
	J. Six Water Seal Latrines (replacing Pit types)	1,500.00	1,225.47			274.53*	Work not completed..
	K. Machinery & Equipment for Chemical Dept.	144,181.00	64,792.25			79,388.75*	Purchases not completed.
	L. Extra Well for Dartonfield	2,500.00	736.66			1,763.34*	Work not completed..
	M. Equipment for Factory	94,275.00	92,032.56			2,242.44*	Payments not completed.
	N. Saw Bench & Equipment for Workshop	7,459.00	6,839.69			619.31*	Purchases not completed.
	O. Electrical lights for H'galla Buildings	7,500.00	6,369.68			1,130.32*	Work not completed..
	P. 1 Calculating Machine	1,350.00	961.00			389.00	Over estimate.
	Q. 1 Macerating Mill & 1 Blanketting Mill	45,000.00	38,391.55			6,608.45*	Payments not completed.
	R. 1 Pick-up Van for internal transport	12,500.00	12,500.00				
	S. Equipment for Agronomy Department	4,600.00	1,807.39			2,792.61*	Purchases not completed.
	T. Furniture and Fixed Equipment	3,000.00	2,998.00			2.00	
	U. Hedigalla Cart Road	40,685.00	43,271.31		2,586.31		Higher cost of terracing and culverts.
1.	School and Creche at Hedigalla	4,084.00	4,084.00				—
2.	School-master's Quarters & Co-op. Stores at Hedigalla	4,183.00	4,159.96			23.04	—

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—(*Contd.*)

EXPENDITURE

Head of Estimate	Account	Estimate	Capital	Revenue	Excess	Savings	Remarks
3.	Converting Engine Driver's Quarters into Workshop	3,497.00	2,542.42			954.58*	Work not completed.
4.	Indoor Sanitation for J.S. Bungalows at Nivitigalakele and Hedigalla	3,313.00	150.00			3,163.00*	Work not completed.
5.	Renovating Dartonfield and Nivitigalakele Conductors' Bungalows	456.00	369.89			86.11	Over estimate.
6.	Ceiling, etc. to Dining Rooms converted from Store-rooms in 15 Junior Staff Bungalows	7,500.00	5,797.58			1,702.42*	Work not completed.
7.	Junior Staff Bungalow and Extension to two Chummeries	49,314.00	46,428.71			2,885.29*	Payments not completed.
8.	Scrap Washer for Factory	19,960.00	16,624.08			3,335.92*	Payments not completed.
9.	Water and Power Supply Dartonfield	7,386.00	5,364.43			2,015.57*	Work not completed.
10.	1 Cattle Bridge (Dartonfield)	2,900.00	1,180.18			1,719.82	Savings affected by use of available material etc.
11.	Tunnel Type Smoke House Dartonfield	38,700.00	39,433 51		733.51		Under estimate.
12.	Drying Chamber Dartonfield	1,484.00	1,494.70		10.70		—
13.	Dartonfield Factory Extension	23,128.00	22,371.74			756.26*	Payments not completed.
14.	Electrical Lighting set for Dartonfield	99,376.00	50,320.41			49,055.59*	Payments not completed.
15.	Intermediate Staff Bungalow at Dartonfield	22,749.00	14,902.92			7,846.08*	Extra room not constructed.

STATEMENT OF EXCESSES AND SAVINGS ON VOTES—(*Contd.*)

Head of Estimate	Account	EXPENDITURE Estimate	Capital	Revenue	Excess	Savings	Remarks
16.	Four Double Labourers' Cottages at Dartonfield	—	833.56		833.56		Retention Money not provided for.
17.	Stores and Garage at Dartonfield	3,032.00	1,062.92			1,969.08*	Work not completed.
18.	Indoor Sanitation for J.S. Bungalow at Dartonfield	5,814.00	969.51			4,844.49*	Work not completed.
19.	Additional Water Supply (Dartonfield)	942.00	1,155.79		213.79		Under estimate.
20.	Hedigalla Water Supply	8,080.00	3,556.27			4,523.73*	Work not completed.
21.	Electric Lights for J.S. Bungalows (Nivitigalakele)	764.00	15.00			749.00*	Work not completed.
22.	Hand Roller for Hedigalla	639.00	168.45			470.55*	Work not completed.
23.	Six double labourers' cottages and latrines and 6 Water seal latrines	3,430.00	3,695.45		265.45		Under estimate.
24.	Portable Cantry for Factory	160.00	—			160.00	Economies.
25.	Six Single and 14 Double Water Seal Latrines	190.00	197.82		7.82		Under estimate.
26.	Store for Sulphur	1,344.00	1,202.86			141.14	Payments not completed.
27.	Sulphur Dusting Equipment	1,615.00	1,558.44			56.56	Economies
28.	2 Portable Gas Machines and Sheds etc.	6,500.00	2,240.32			4,259.68*	Gas Machines not purchased.
29.	Improvement to Dartonfield Approach Road	17,500.00	—			17,500.00*	Work not completed by P.W.D.

Items marked with an asterisk to be revoted for 1954.
Total Rs. 234,979.22

ESTIMATES FOR 1955

(Adopted by the Board, 17th January, 1955)

Estimate of Income for 1955

1.	Cess Collections	Rs.	1,108,800
2.	Government Grant for Smallholdings Work ...	,,	211,500
3.	Interest	,,	88,000
4.	Sale of Publications	,,	2,500
5.	Sale of Planting Material	,,	27,610
6.	Profit from Dartonfield Group Working	,,	16,162
7.	Sundry Receipts	,,	5,450
		Rs.	1,460,022

ESTIMATE OF EXPENDITURE FOR 1955

1.	**Administration of the Board:—**					
	(*a*) Travelling Expenses of Board Members	Rs.	7,500			
	(*b*) Entertainment of Board Members	,,	250	Rs.	7,750	
2.	**Personal Emoluments:—**					
	(*a*) Senior Scientific Staff ...	,,	159,230			
	(*b*) Junior Scientific Staff ...	,,	44,990	Rs.	204,220	
3.	**Library and Publications:—**					
	(*a*) Library	,,	6,000			
	(*b*) Publications	,,	7,500	,,	13,500	
4.	**Smallholdings Department:—**					
	(*a*) Salaries & Allowances ...	,,	245,030			
	(*b*) Travelling & General Expenses ...	,,	83,400	,,	328,430	
5.	**Laboratory:—**					
	(*a*) Equipment & Working Expenses ...	,,	30,000			
	(*b*) Furniture Replacements ...	,,	600	,,	30,600	
	Carried over ...			Rs.	584,500	

	Brought forward ...					Rs.	584,500
6.	**Field & Factory Experiments:—**						
	(*a*) Field Experiments ...	...	,,	41,700			
	(*b*) Factory Experiments ...	...	,,	23,000	,,		64,700
7.	**Office:—**						
	(*a*) Salaries of Office Staff	...	,,	44,310			
	(*b*) Stationery & Office Equipment	...	,,	6,500			
	(*c*) Postages & Telegrams	...	,,	4,500			
	(*d*) Advertising ...	...	,,	2,000			
	(*e*) Telephones ...	...	,,	1,760			
	(*f*) Audit	...	,,	1,600	,,		60,670
8.	**Travelling Expenses of Staff:—**						
	Officers' Expenses ...	...				Rs.	24,500
9.	**Maintenance Charges:—**						
	(*a*) General Buildings ...	...	Rs.	4,000			
	(*b*) Bungalows ...	...	,,	5,000			
	(*c*) Water & Power Supply	...	,,	22,420			
	(*d*) Motor Vehicles ...	...	,,	12,320	,,		43,740
10.	**Miscellaneous items shared with Estates:—**						
	(*a*) Dartonfield Group General Charges		Rs.	15,000			
	(*b*) Upkeep of Building Premises	...	,,	8,600			
	(*c*) Factory Upkeep ...	...	,,	7,890	,,		31,490
11.	**Other Charges:—**						
	(*a*) Contribution to London Advisory Committee ...	...	Rs.	5,000			
	(*b*) Contribution to B.R.P.R.A.	...	,,	150,000			
	(*c*) Contingencies ...	...	,,	1,500			
	(*d*) Insurance Charges ...	...	,,	9,000			
	(*e*) Staff Provident Fund ...	...	,,	86,000			
	(*f*) Passages	...	,,	15,000			
	(*g*) Entertainment Allowance	...	,,	500			
	(*h*) Dearness Allowance to Staff	...	,,	116,060			
	(*i*) Assistant Staff Medical Fund	...	,,	6,100			
	(*j*) Senior Staff Medical Scheme	...	,,	3,000			
	(*k*) Social Services ...	...	,,	2,000	,,		394,160
12.	**Depreciation**	...			,,		100,700
13.	**Renovations & Replacements** ...				,,		14,500
				TOTAL ...		Rs.	1,318,960

CAPITAL EXPENDITURE

1.	**Agricultural Development**	Rs.	220,843
2.	**Buildings**	,,	62,125
3.	**Water & Power Supply**	,,	3,500
4.	**Roads**	,,	17,000
5.	**Vehicles**	,,	11,500
6.	**Equipment Etc.**	,,	45,700
7.	**Miscellaneous**	,,	650
	TOTAL ...	Rs.	361,318

SUMMARY

Income		Rs.	1,460,022
Expenditure:—			
Revenue	Rs. 1,318,960		
Capital	,, 361,318	,,	1,680,278
Excess of Expenditure over Income ...		Rs.	220,256

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